

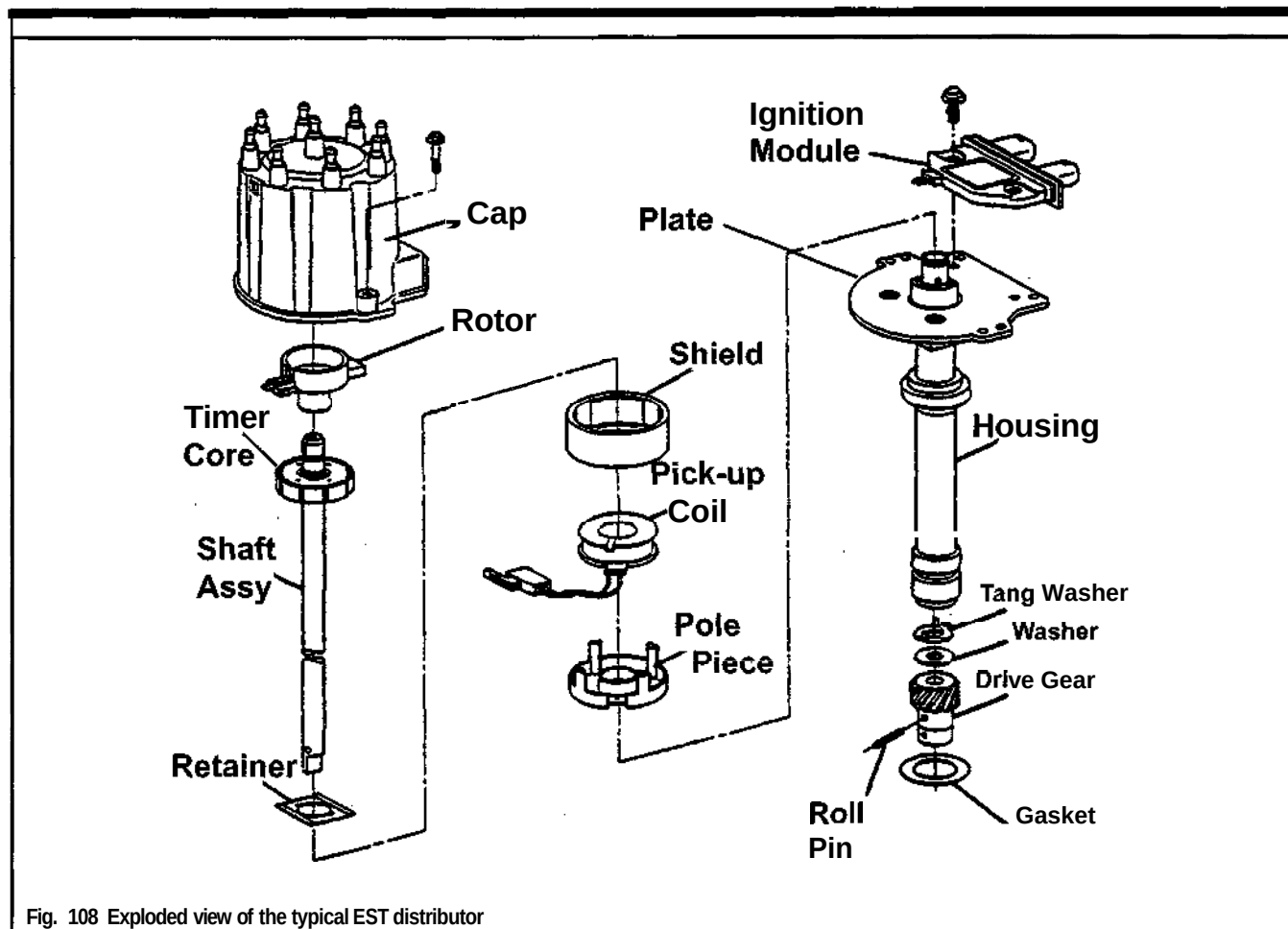
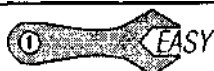


Fig. 108 Exploded view of the typical EST distributor

VISUAL CHECKS



Check the coil tower for carbon tracking. Check the terminals for secure connections. Verify the polarity is correct. Check the coil nipple to be sure it is sealed and insulated. If flashover should occur at this location, the engine will fail to start.

Check the distributor cap for carbon tracking. Clean the cap if it is dirty. Moisture and dirt make a good path for flashover. If a carbon track has started, the cap must be replaced. Check the rotor for carbon tracking and cleanliness. Again, if carbon track has started, the rotor must be replaced.

Check the high tension leads to the spark plugs for burning, cracking and any type of deterioration. Check the spark plug for fouling, proper gap and possible cracked insulator.

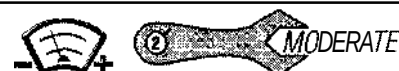
12 VOLT (Bt)



◆ See Figure 109

1. Connect a multi-meter as per the manufacturers instructions.
2. Disconnect the purple and gray wire connector at the ignition coil.
3. Connect the positive lead on the meter to the terminal for the purple wire in the connector; connect the negative lead to ground.
4. Turn the ignition switch to the **ON** position and check that the meter reads at least 8 V.
5. Plug the connector back into the coil and disconnect the pink and brown connector at the distributor.
6. Connect the positive lead on the meter to the terminal for the pink wire in the connector; connect the negative lead to ground.
7. Turn the ignition switch to the **ON** position and check that the meter reads at least 8 V.

IGNITION COIL



◆ See Figure 109

CAUTION

Disconnect both connectors from the coil before performing the following test.

1. Check for short to ground: Connect one meter lead to the frame as a ground. Make contact with the other meter lead to the Purple wire terminal on the coil. The meter should indicate an infinite reading. If the meter indicates less than an infinite reading, the ignition coil has a short to ground. The coil must be replaced.
2. Check for an open or short in the Primary circuit: Set the ohmmeter to the low scale. Connect one meter lead to the Purple wire terminal. Make contact with the other meter lead to the Gray wire terminal for the tach lead. The meter should indicate 0.35-0.45 ohms. If the meter indicates higher ohms, the primary circuit probably has an open. If the meter reading is low, the primary circuit has a short. Either condition requires that the coil must be replaced.
3. Check for an open or short in the Secondary circuit: Set the meter to the high scale. Connect one meter lead to the Purple wire terminal. Make contact with the other meter lead to the high tension terminal. The meter should indicate 7500-9000 ohms. If the meter indicates less than 7500 ohms, the circuit has a short. If the meter indicates more than 9000 ohms, the circuit probably has an open. Either condition demands that the coil must be replaced.
4. Install the black coil connector (distributor harness) first and then install the gray connector (engine harness).

10-42 IGNITION AND ELECTRICAL SYSTEMS

PICK-UP COIL

◆ See Figure 110



1. Connect a multi-meter as per the manufacturers instructions.
2. Remove the screws securing the distributor cap, and then remove the cap and the rotor. Release the locking tab and unplug the pick-up coil connector. On almost all models these two wires should be white and green.
3. Check for short to ground: Set the ohmmeter to the high scale. Connect one meter lead to the distributor body. Make contact with the other meter lead to either of the wire terminals in the connector. The meter should indicate an infinite reading. A reading of less than infinite, indicates the coil has a shorted circuit. The coil must be replaced.
4. Check for open or shorted coil: Set the ohmmeter to the high scale. Connect one meter lead to the green wire pickup coil terminal. Make contact with the other meter lead to the white wire coil terminal. If the wires on your connector are a different color, simply connect the meter to each of the terminals in the connector. The meter should have a constant indication of 700-900 ohms. If the meter indicates more than 900 ohms, the coil probably has an open circuit and the coil must be replaced. If the meter indicates less than 700 ohms the coil probably has a shorted circuit and the coil must be replaced. Make sure that you bend the leads slightly while testing to determine any intermittent open circuits.

IGNITION MODULE

The ignition module in the distributor either produces a spark or it fails to produce an adequate spark. If all other tests have been performed with satisfactory results and the problem still exists—replace the ignition module.

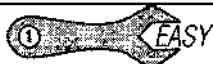
INDUCTOR

The primary circuit between the 2-wire terminal on the ignition module and the ignition coil utilizes an inductor on the pink wire to protect against RFI interference. If interference is detected, the inductor has failed and the entire 2-wire harness will require replacement.

Distributor Cap

REMOVAL & INSTALLATION

◆ See Figure 111 and 112



□ It is not necessary to remove the spark plug leads at the cap when removing it. If you do remove them, be sure to tag each of them to ensure correct installation.

1. Disconnect the battery cables.
2. Remove the distributor cap mounting screws and lift off the cap. Some caps may have a vent connection; if yours does, unplug the hose.

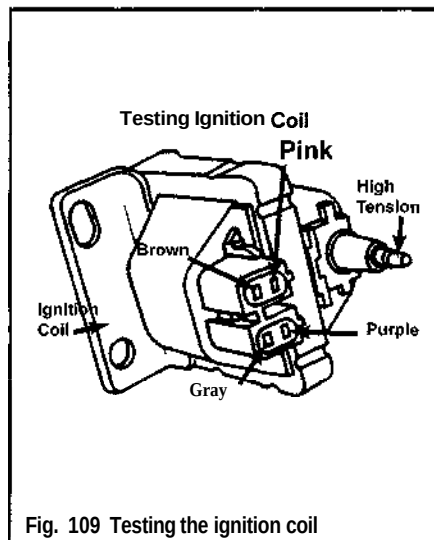


Fig. 109 Testing the ignition coil

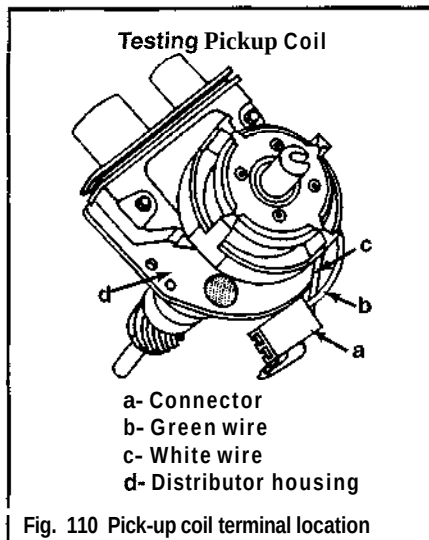


Fig. 110 Pick-up coil terminal location

3. Clean the cap with warm soapy water—if you have not removed the spark plug wires, you must, obviously, do it at this time. Blow it dry with compressed air, or if not available, make sure it air dries completely prior to installation.

4. Check the cap contacts for excessive burning, wear or corrosion. Check the cap for cracks or wear.

5. Install the cap by fitting the tab into the notch in the distributor housing and tighten the screws securely. Reconnect the plug wires if disconnected.

Distributor

REMOVAL



1. Begin by disconnecting the high tension leads from the distributor. Take time to identify and tag each lead as an aid during installation to ensure they are properly installed for correct cylinder firing.

2. Lift the locking tabs and disconnect the 2- and 4-terminal connectors. Rotate the crankshaft until No. 1 cylinder is in the firing position—both valves for No. 1 are closed and the timing mark on the harmonic balancer is aligned with the 0° (TDC) mark on the grid attached to the front cover.

3. Remove the two screws securing the distributor cap in place, and then remove the cap.

4. Now, note the position of the rotor tip. Take time to make a reference mark on the distributor housing to enable the rotor and the housing to be properly aligned during installation.

5. Make a mark on the distributor base and a matching mark on the engine as an aid during installation to ensure the distributor will be installed back in its original position.

Take care to prevent the crankshaft from being rotated—even slightly—while the distributor is out of the block. If the crankshaft should be rotated—follow the procedures listed under Engine Disturbed later in this section.

6. Remove the distributor clamp bolt and lift the distributor straight up and clear of the engine. The gasket should be discarded.

INSTALLATION

Engine Not Disturbed



1. Perform the following procedures if the distributor and engine were marked prior to removal and there is no evidence to indicate that the crankshaft was rotated while the distributor was removed. If the distributor was not marked, as instructed in the removal procedures, or if the crankshaft was rotated—even slightly—while the distributor was out, proceed to the Engine Disturbed section.



Fig. 111 Remove the cap with the wires attached (3.0L shown)

2. Install the rotor and rotate it approximately 118 turn counterclockwise from the reference mark made prior to disassembling. Rotor rotation at this time is necessary because as the distributor shaft gear indexes with the camshaft gear, the shaft will rotate clockwise about 1/8 turn—the rotor will then be back where it should be for the No. 1 cylinder to fire.

3. Position a new distributor gasket in place on the engine. A reference mark should have been made on the distributor and the block prior to removal, as instructed in the removal procedures. Install the distributor into the block with the mark on the distributor roughly aligned with the mark on the block. Push the distributor fully into the block until the housing is seated.

***WARNING

If necessary, rotate the rotor slightly to permit the gear on the lower end of the distributor shaft to index with the gear on the camshaft. The "spade" on the lower end of the distributor shaft must engage the slot for the oil pump. You can also insert a small screwdriver into the opening and turn the pump shaft. Failure to index would result in no engine oil circulation—disaster. The distributor shaft collar should now be fully seated on the block. However, once the distributor is in place the rotor reference marks and the distributor housing marks should both be aligned.

4. Secure the distributor in place with the hold down clamp and bolt. Tighten the bolt to the proper specification as detailed in the Torque Specifications chart for your particular engine (snug, but not more than 20 ft. lbs.).

5. Connect the 2-and 3-wire leads into the distributor.

6. Install the cap and tighten the screws securely. The cap can only be installed properly—one way. Lubricate the sockets in the distributor cap with wheel bearing grease, or the equivalent. Install the spark plug high tension leads (if they were removed) using the identification made during removal to ensure proper cylinder firing.

7. Check the ignition timing.

Engine Disturbed



The following procedures are to be performed if reference marks were not made for the rotor, the distributor housing and the engine block or if the crankshaft was rotated while the distributor was out of the block.

1. Rotate the crankshaft until the No. 1 cylinder is ready to fire—both valves are closed and the timing mark on the harmonic balancer is aligned with the 0° mark on the grid attached to the front cover.

2. Position a new gasket in place on the engine block. Install the distributor into the block.

If it is not possible to fully seat the distributor in place on the block, press down lightly on the distributor housing and at the same time rotate the rotor slightly. This action will permit the gear on the lower end of the distributor shaft to index with the camshaft gear. The "spade" on the lower end of the distributor shaft should engage the slot for the oil pump. The distributor shaft collar should now be fully seated on the block.

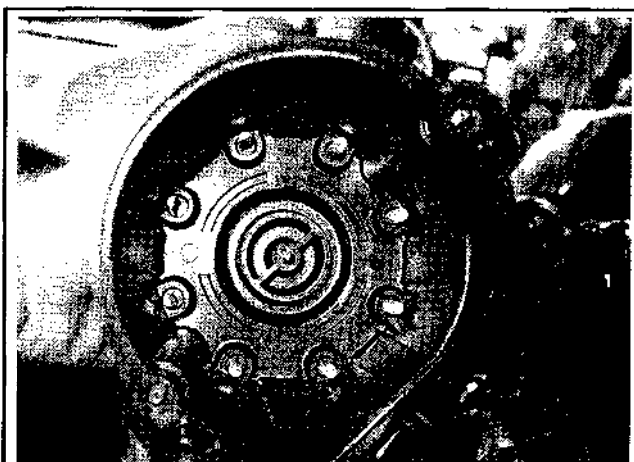


Fig. 112 A good look at the cap on the 7.4Gi

3. Once the distributor is fully seated, install the clamp and bolt, but leave it just loose enough to permit rotating the distributor with strong hand pressure. At this point, the rotor must be in position to fire the No. 1 cylinder.

4. Just place the cap in position on the distributor. Scribe a mark on the distributor housing aligned with the No. 1 spark plug terminal. Now, remove the cap and verify the rotor is aligned with the mark just made for the No. 1 spark plug terminal. If the rotor does not align with the mark, rotate the distributor housing—with difficulty, because the clamp was not tightened—right or left to align the rotor with the mark for the No. 1 terminal. If it is not possible to align the rotor with the No. 1 mark, the distributor must be removed the entire procedure started over again.

5. Tighten the distributor clamp bolt to the proper specification as detailed in the Torque Specifications chart for your particular engine (snug, but not more than 20 ft. lbs.).

6. Check all high tension leads and connect them in the proper sequence for correct cylinder firing.

7. Connect the 2-wire engine harness connector to the distributor.

8. Check the ignition timing.

DISASSEMBLY



◆ See Figures 107,108, and 113 thru 119

Remove the distributor from the engine, as outlined in the previous section. The following procedures pick up the work after the distributor has been removed and is on a suitable work surface.

1. Pull the rotor free from the upper end of the distributor shaft.

2. Disconnect the connector at the ignition module, pry the retainer free and then lift out the pick-up coil.

3. Disconnect the 2 ignition module leads. Remove the two screws securing the module to the distributor, and then remove the module. It may be necessary to carefully pry the module loose from the distributor.

4. Make a mark on the drive tang at the lower end of the distributor shaft and another mark on the collar of the gear aligned with the first mark as an aid to installing the gear back in its original position. After the marks have been made, drive the roll pin free of the gear with a small (4.5mm) punch.

5. Slide the gear free of the shaft, and then separate the shaft by pulling it up through the top of the pick-up coil—the timer core will come with it.

6. Carefully pry off the retainer on the end of the housing securing the shield, coil and pole piece. Slide them all off and discard the retainer.

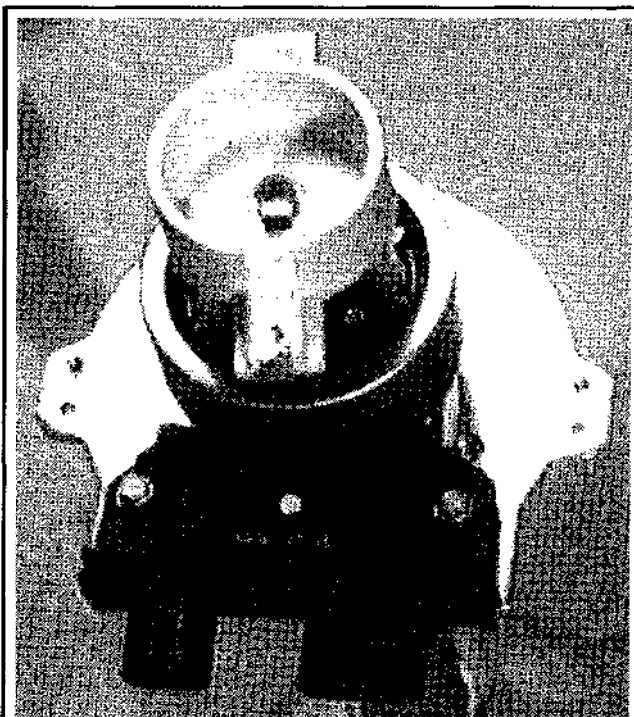


Fig. 113 A good view of the EST distributor

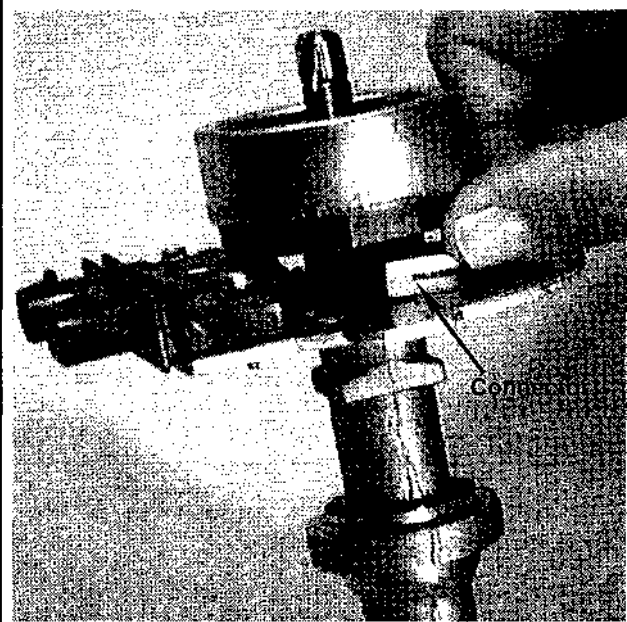


Fig. 114 Unplug the pick-up coil connector...

CLEANING AND INSPECTING



Obtain a clean cloth and wipe the distributor cap clean. Inspect the cap for chips, cracks and any sign of a carbon path. If such a path is discovered, the cap must be replaced because such a path would permit high tension leakage.

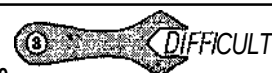
Clean loose corrosion from the terminal segments inside the cap. Do not use emery cloth or sandpaper. If the segments are deeply grooved, a new cap should be installed.

Inspect the terminal sockets for corrosion. Clean the sockets using a stiff wire brush to loosen the corrosion. After the sockets are clean, lubricate them with wheel bearing grease, or equivalent.

Inspect the rotor for cracks. Check to be sure the tip of the rotor is not badly burned. Such a condition demands the rotor be replaced.

Inspect the trigger wheel for any sign of contact with the sensor. If the distributor has been removed from the block, make an attempt to check the distributor shaft for excessive wear between the shaft and the bushings in the housing.

ASSEMBLY



◆ See Figures 107,108 and 113 thru 120

The following procedures pickup the work after disassembled parts have been cleaned and replacement items have been obtained and are on hand.

1. Align the pole piece with the housing and slide it onto the end of the housing. Align the tab on the coil with the hole in the base of the housing.

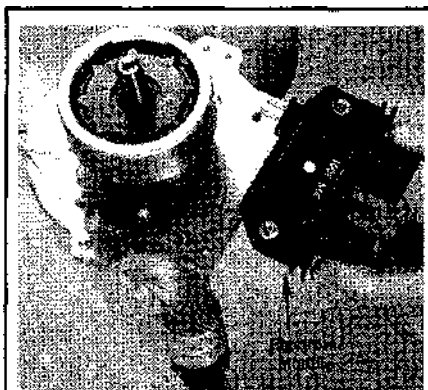


Fig. 115 ...and remove the ignition module

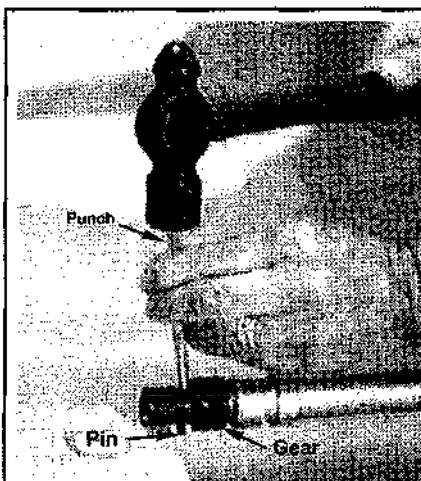


Fig. 116 Driving out the roll pin

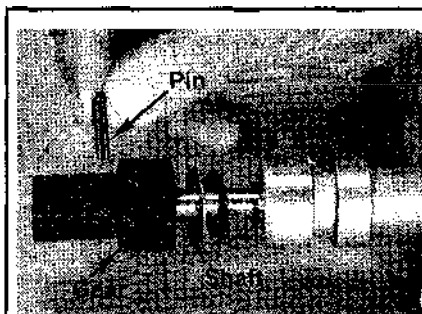


Fig. 117 Close up of the pin and the gear

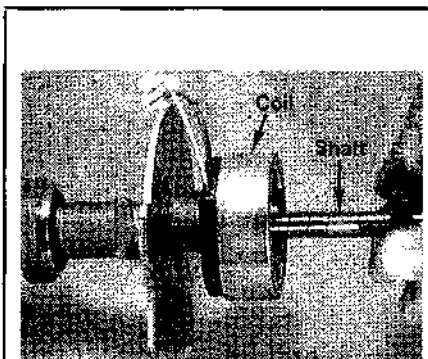


Fig. 118 Pull the shaft up through the coil. Note that the timer core stays with the shaft

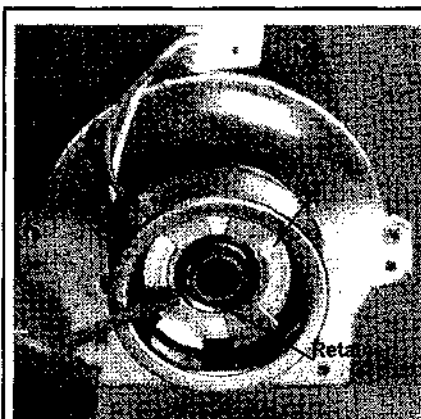


Fig. 119 Pry up the retainer

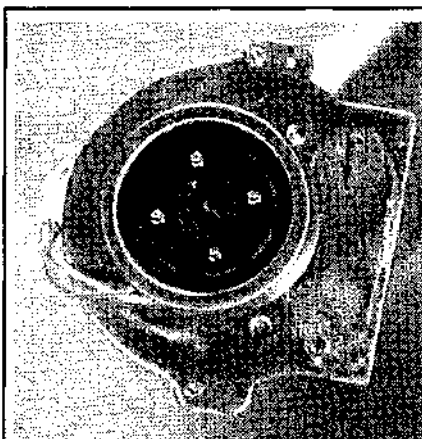


Fig. 120 Coat the plate with grease

2. Install the shield and a new retainer over the end of the housing. Position a 5/16 in. socket over the retainer and lightly tap it into place over the end of the housing—make sure it is seated firmly into the groove.
3. Coat the distributor shaft with oil and slide into and through the center of the housing. Spin it several times to lubricate it and the housing.
4. Slide the star washer onto the shaft so that the teeth are pointing up toward the top of the housing. Slide the flat washer and the gear onto the shaft so that the alignment marks made earlier line up. Insert the roll pin and drive it down until it is flush.
5. Make sure the surface of the distributor plate is clean and then spread an even coat of Thermal Conductive grease onto the bottom of the module. Position the module on the plate and tighten the two screws securely; clean any excess grease from the plate and module.
6. Connect the lead from the coil to the back of the module and lock it in place.
7. Align the rotor with the notch in the distributor shaft, and then press it to secure it in place.

Ignition Coil

REMOVAL & INSTALLATION



1. Disconnect the negative battery cable.
2. Disconnect the high tension lead coming from the distributor.
3. Tag and disconnect the coil electrical leads (two 2-pin connectors).
4. Remove the two coil mounting bolts and lift out the coil (with the bracket attached, if equipped).
5. Install the coil and tighten the mounting bolts to 20-25 ft. lbs. (27-34 Nm).
6. Connect the electrical leads and the high tension lead.
7. Connect the battery cable.

PRESTOLITE INTEGRAL BREAKERLESS INDUCTIVE DISTRIBUTOR (BID) SYSTEM

Description

- ◆ See Figures 121, 122 and 123

Basic components of this system include a pointless distributor and a remote ignition coil. The distributor has the external appearance of a conventional distributor—the cap and rotor will appear quite familiar, but the remainder of the internal items are completely different. A trigger "wheel" is mounted near the upper end of the distributor shaft. This "wheel" has "teeth"—the number corresponding to the number of engine cylinders. A horseshoe shaped sensor/electronic ignition module is mounted around the distributor shaft and "wheel". The sensor portion of the module and the "wheel" replace the breaker points and condenser from earlier systems. This sensor/module controls ignition timing and ignition coil saturation.

The BID system contains two separate circuits—a primary circuit—and a secondary circuit. The primary circuit handles the low voltage current supplied by the battery or by the alternator. Major components of this circuit are the primary winding of the ignition coil, the electronic control module including the sensor and the low tension wiring. The secondary circuit handles the high voltage surges produced by the ignition coil. This high voltage is routed to each spark plug through the high tension leads. Components of this circuit include the secondary winding of the ignition coil, the high tension leads between the coil and the distributor and between the distributor, the high tension leads to each spark plug, the distributor rotor, and the distributor cap.

The sensor is a coil of very fine wire molded into a plastic housing. The housing is mounted on the base plate in the distributor and is connected directly to, and considered an integral part of, the ignition module. The sensor is not serviceable and must be replaced as an assembly along with the module.

The electronic ignition module is a self-contained solid state unit encapsulated with potting compound. This compound provides a protective barrier against vibration and moisture. The module contains an oscillator and a transistor. It is not serviceable and must be replaced along with the sensor.

The BID system operates on the principle of a metal detector. The detector is the sensor in the module and the detected metal is the "tooth" in the trigger "wheel".

As the "wheel" near the upper end of the distributor shaft rotates, the sensor detects the metal "tooth"; the oscillator in the ignition module is at a low level; the transistor is OFF; and primary current does not flow. If this were a breaker point system—the points would be open.

After the "tooth" of the "wheel" passes the sensor, the oscillator is at a high level, the transistor is ON; and current flows in the primary winding. With a breaker point system—the points would be closed.

The high voltage surge developed in the secondary winding of the ignition coil is transferred to the proper spark plug through the cable; the center of the distributor cap; the distributor rotor; to the proper cap contact point when the rotor aligns with the point; and finally through the high tension lead to the spark plug in the cylinder.

This sequence is repeated as each "tooth on the trigger "wheel" passes the sensor.

Initial manual setting of the distributor is made when a tooth of the trigger wheel passes the sensor at the instant the No. 1 piston is at an exact position in the cylinder—namely TDC. This position is indicated by the timing mark on all GM engines, or the pointer on Ford engines, and the timing grid.

At high engine rpm, the spark must occur earlier than at idle speed. This advance spark gives the fuel/air mixture time to ignite, burn, and deliver its power to the piston as it starts down on the power stroke. Therefore, the spark advance is governed by engine speed. A centrifugal advance arrangement consisting of an advance cam, two weights, two springs and a weight base plate is installed in the distributor to accomplish the advance timing.

When the engine is at idle, the springs hold the advance weights so there is no advance. Therefore, spark timing occurs as set by the initial manual setting of the distributor.

When engine speed increases, centrifugal force causes the weights to move outward and push against the advance cam, thus rotating the weight plate. As the plate rotates, the teeth of the trigger wheel will pass the sensor earlier in the compression stroke, thus advancing the spark,

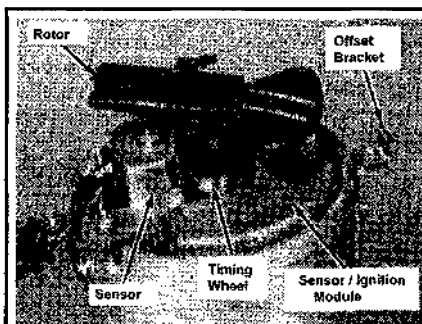


Fig. 121 A close-up of the BID distributor with the cap removed...

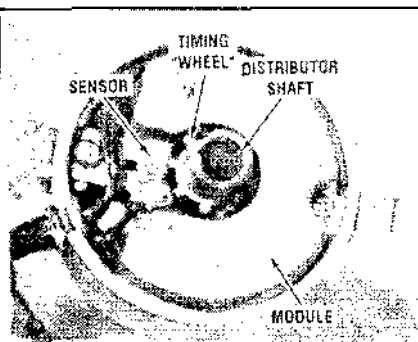


Fig. 122 ...and a better view with the rotor removed

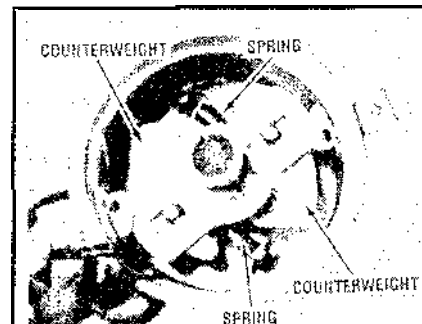


Fig. 123 Centrifugal weight arrangement

Troubleshooting

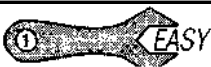


** CAUTION

Always ground the high tension lead of the coil any time it is disconnected from the distributor. Failure to disconnect the lead could result in fire or an explosion, if gas vapors are present. Reason: A high voltage discharge in the secondary circuit of the coil may occur when the ignition switch is turned to the on and off positions. This high voltage discharge may occur even if the engine is not cranked.

Before spending too much time and money attempting to trace a problem to the ignition system, a compression check of the cylinders should be made. If the cylinders do not have adequate compression, troubleshooting and attempted service of the ignition or fuel system will fail to give the desired results of satisfactory engine performance.

VISUAL CHECKS



Check the coil tower for carbon tracking. Check the terminals for secure connections. Verify the polarity is correct. Check the coil nipple to be sure it is sealed and insulated. If flashover should occur at this location, the engine will fail to start.

Check the distributor cap for carbon tracking. Clean the cap if it is dirty. Moisture and dirt make a good path for flashover. If a carbon track has started, the cap must be replaced. Check the rotor for carbon tracking and cleanliness. Again, if carbon track has started, the rotor must be replaced.

Check the high tension leads to the spark plugs for burning, cracking and any type of deterioration. Check the spark plug for fouling, proper gap and possible cracked insulator.

SENSOR AIR GAP



4 See Figure 124

All models equipped with BID ignition systems require an air gap adjustment between the sensor wheel and the trigger wheel; particularly after the distributor has been removed. It is also a good idea to ensure that the air gap is within specification prior to performing any ignition timing procedures.

1. Open or remove the engine hatches.
2. Remove the distributor cap and pull off the rotor as detailed later in this section.
3. Connect a remote starter switch as detailed in the manufacturer's instructions.
4. Check the sensor coil, trigger wheel and teeth for signs of wear or other obvious damage. Using the remote starter, crank the engine around until a tooth on the wheel aligns with the contact on the coil.
5. Insert a nonmetallic flat-bladed feeler gauge between the coil and tooth. The gap should be 0.008 in. (0.20mm).
6. If not within specification, loosen the small screw (A) on the trigger coil slightly and move the coil carefully until the gap is within spec. Tighten the screw securely—but not too tight—and recheck that the gap has not changed.
7. Disconnect the remote starter.
8. Install the rotor and distributor cap.

PRIMARY VOLTAGE TEST



4 See Figures 125, 126 and 127

1. Remove the distributor cap and connect a voltmeter as per the manufacturer's instructions. Bump the engine over until the sensor is between any two teeth on the trigger wheel. Turn the ignition switch to the ON position.
2. Connect the meter leads to their corresponding battery terminals and confirm that 12-13 V is present at the battery. Charge or replace the battery if voltage is less than suggested.

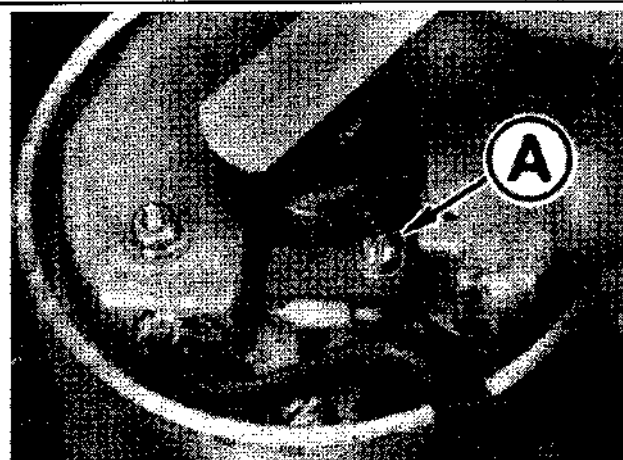


Fig. 124 Checking the distributor air gap

3. Connect the negative lead on the meter to the negative battery terminal or a good ground. Connect the positive lead to the positive terminal on the ignition coil. The meter should indicate battery voltage as shown in Step 2 (within 1V); if less, move to the Voltage Drop Test.

4. With the negative lead still connected as in the previous step, connect the positive lead to negative terminal on the coil. If the meter indicates 4-8V, ground the high tension lead from the coil and position a screwdriver in front of the sensor face, discharging the coil. The meter should now indicate 12-13V. If less than suggested, the coil or the sensor/module will require replacement. Replace the coil as necessary and then perform the test with the screwdriver again—if still no spark, replace the sensor and reset the air gap.

If the meter indicated less than 4V, disconnect the meter lead at the coil and remove the wire at the negative terminal on the coil. Now connect the meter lead to the negative terminal again and confirm that the reading is 12-13V. If so, there is a short in the sensor assembly and you will need to replace the unit. If the reading is only 0-4V, the coil primary circuit has an open and you'll need to replace the coil.

If the meter originally showed more than 8V in the first test of this step, check for an open distributor ground circuit or a shorted coil primary circuit. If the distributor ground is bad, repair the circuit. If it is OK, replace the sensor assembly. If coil primary circuit is showing a short, replace the coil.

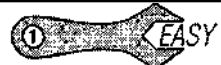
VOLTAGE DROP TEST



1. Remove the distributor cap and connect a voltmeter as per the manufacturer's instructions. Bump the engine over until the sensor is between any two teeth on the trigger wheel. Turn the ignition switch to the ON position.
2. Connect the positive meter lead to the positive terminal on the battery. Connect the negative meter lead to the positive terminal on the ignition coil. If the meter indicates less than 1V, check all connections. If the meter fluctuates, check for a loose connection. Repair either option prior to moving to the next step.
3. Connect the negative meter lead to the negative terminal on the battery. Connect the positive meter lead to the housing on the sensor assembly. If the meter indicates more than 1V, check and tighten all ground connections and inspect the negative battery terminal. Confirm that the sensor mounting screws are tight. Repeat the test, if the reading is above 1V again, replace the battery ground cable.
4. Check the advance mechanism in the distributor and the ignition timing.

Distributor Cap

REMOVAL & INSTALLATION



It is not necessary to remove the spark plug leads at the cap when removing it. If you do remove them, be sure to tag each of them to ensure correct installation.

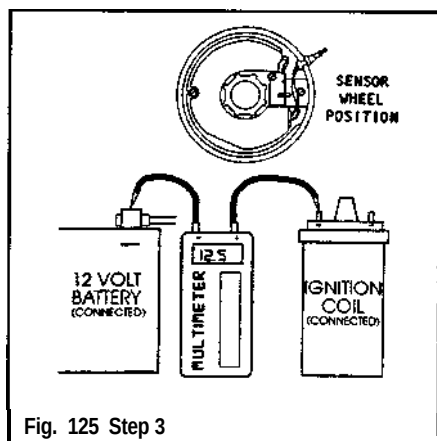


Fig. 125 Step 3

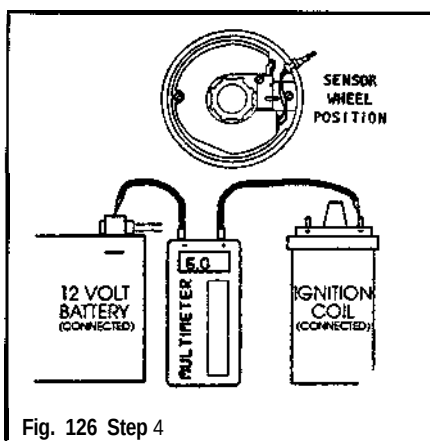


Fig. 126 Step 4

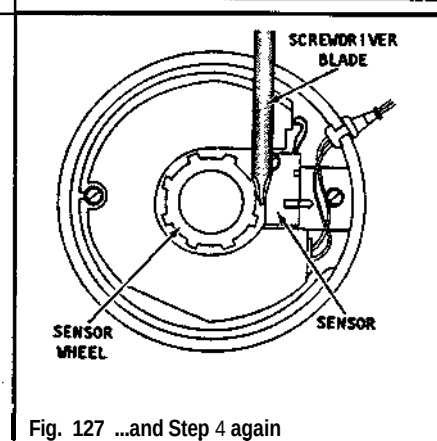


Fig. 127 ...and Step 4 again

1. Disconnect the battery cables.
2. Remove the distributor cap mounting screws and lift off the cap. Some caps may have a vent connection; if yours does, unplug the hose.
3. Clean the cap with warm soapy water—if you have not removed the spark plug wires, you must, obviously, do it at this time. Blow it dry with compressed air; or if not available, make sure it air dries completely prior to installation.
4. Check the cap contacts for excessive burning, wear or corrosion. Check the cap for cracks or wear.
5. Install the cap by fitting the tab into the notch in the distributor housing and tighten the screws securely. Reconnect the plug wires if disconnected.

Distributor

REMOVAL



1. Begin by disconnecting the high tension leads from the distributor. Take time to identify and tag each lead as an aid during installation to ensure they are properly installed for correct cylinder firing.
2. Rotate the crankshaft until No. 1 cylinder is in the firing position—both valves for No. 1 are closed and the timing mark (or pointer) on the harmonic balancer is aligned with the 0° mark on the grid attached to the front cover.
3. Remove the two screws securing the distributor cap in place, and then remove the cap.
4. Now, note the position of the rotor tip. Take time to make a reference mark on the distributor housing to enable the rotor and the housing to be properly aligned during installation.
5. Make a mark on the distributor base and a matching mark on the engine as an aid during installation to ensure the distributor will be installed back in its original position.

■ Take care to prevent the crankshaft from being rotated—even slightly—while the distributor is out of the block. If the crankshaft should be rotated—follow the procedures listed under Engine Disturbed later in this section.

6. Remove the distributor clamp bolt and lift the distributor straight up and clear of the engine. The gasket should be discarded.

INSTALLATION

Engine Not Disturbed



When installing a new distributor on a Ford engine, make sure that you add Ford Engine Oil Supplement to the oil before starting the engine for the first time.

1. Perform the following procedures if the distributor and engine were marked prior to removal and there is no evidence to indicate that the crankshaft was rotated while the distributor was removed. If the distributor

was not marked, as instructed in the removal procedures, or if the crankshaft was rotated—even slightly—while the distributor was out, proceed to the Engine Disturbed section.

2. Install the rotor and rotate it approximately 118 turn counterclockwise from the reference mark made prior to disassembling on GM engines; if the engine you're working on is a Ford, rotate the rotor 1/8 turn clockwise. Rotor rotation at this time is necessary because as the distributor shaft gear indexes with the camshaft gear, the shaft will rotate clockwise about 1/8 turn—the rotor will then be back where it should be for the No. 1 cylinder to fire.

3. Position a new distributor gasket in place on the engine. A reference mark should have been made on the distributor and the block prior to removal, as instructed in the removal procedures. Install the distributor into the block with the mark on the distributor roughly aligned with the mark on the block. Push the distributor fully into the block until the housing is seated.

××WARNING

If necessary, rotate the rotor slightly to permit the gear on the lower end of the distributor shaft to index with the gear on the camshaft. The "spade" on the lower end of the distributor shaft must engage the slot for the oil pump. Failure to index would result in no engine oil circulation—disaster. The distributor shaft collar should now be fully seated on the block. However, once the distributor is in place the rotor reference marks and the distributor housing marks should both be aligned.

4. Secure the distributor in place with the hold down clamp and bolt. Tighten the bolt to the proper specification as detailed in the Torque Specifications chart for your particular engine (snug, but no more than 20 ft. lbs.).
5. Install the cap and tighten the screws securely. The cap can only be installed properly—one way. Lubricate the sockets in the distributor cap with Extreme Pressure grease, or the equivalent. Install the spark plug high tension leads (if they were removed) using the identification made during removal to ensure proper cylinder firing.
6. Check the ignition timing.

Engine Disturbed



■ When installing a new distributor on a Ford engine, make sure that you add Ford Engine Oil Supplement to the oil before starting the engine for the first time.

The following procedures are to be performed if reference marks were not made for the rotor, the distributor housing and the engine block or if the crankshaft was rotated while the distributor was out of the block.

1. Rotate the crankshaft until the No. 1 cylinder is ready to fire—both valves are closed and the timing mark (or pointer) on the harmonic balancer is aligned with the 0° mark on the grid attached to the front cover.
2. Position a new gasket in place on the engine block. Install the distributor into the block.

10-48 IGNITION AND ELECTRICAL SYSTEMS

If it is not possible to fully seat the distributor in place on the block, press down lightly on the distributor housing and at the same time rotate the rotor slightly. This action will permit the gear on the lower end of the distributor shaft to index with the camshaft gear. The "spade" on the lower end of the distributor shaft should engage the slot for the oil pump. The distributor shaft collar should now be fully seated on the block.

3. Once the distributor is fully seated, install the clamp and bolt, but leave it just loose enough to permit rotating the distributor with strong hand pressure. At this point, the rotor must be in position to fire the No. 1 cylinder.

4. Just place the cap in position on the distributor. Scribe a mark on the distributor housing aligned with the No. 1 spark plug terminal. Now, remove the cap and verify the rotor is aligned with the mark just made for the No. 1 spark plug terminal. If the rotor does not align with the mark, rotate the distributor housing—with difficulty, because the clamp was tightened slightly—right or left to align the rotor with the mark for the No. 1 terminal. If it is not possible to align the rotor with the No. 1 mark, the distributor must be removed the entire procedure started over again.

5. Tighten the distributor clamp bolt to the proper specification as detailed in the Torque Specifications chart for your particular engine (snug, but no more than 20 ft. lbs.).

6. Check all high tension leads and connect them in the proper sequence for correct cylinder firing.

7. Check the ignition timing.

DISASSEMBLY



◆ See Figures 123, 128, 129, and 130

Remove the distributor from the engine, as outlined in the previous section. The following procedures pick up the work after the distributor has been removed and is on a suitable work surface.

1. Pull the rotor free from the upper end of the distributor shaft.

2. Loosen the sensor screw (near the trigger wheel, remove the 2 mounting screws and lock-washers and then lift out the sensor/module assembly. Pull the grommet out of the notch in the distributor housing and then disconnect the 2 leads at the ignition coil.

3. No further disassembly is necessary.

CLEANING AND INSPECTING



Obtain a clean cloth and wipe the distributor cap clean. Inspect the cap for chips, cracks and any sign of a carbon path. If such a path is discovered, the cap must be replaced because such a path would permit high tension leakage.

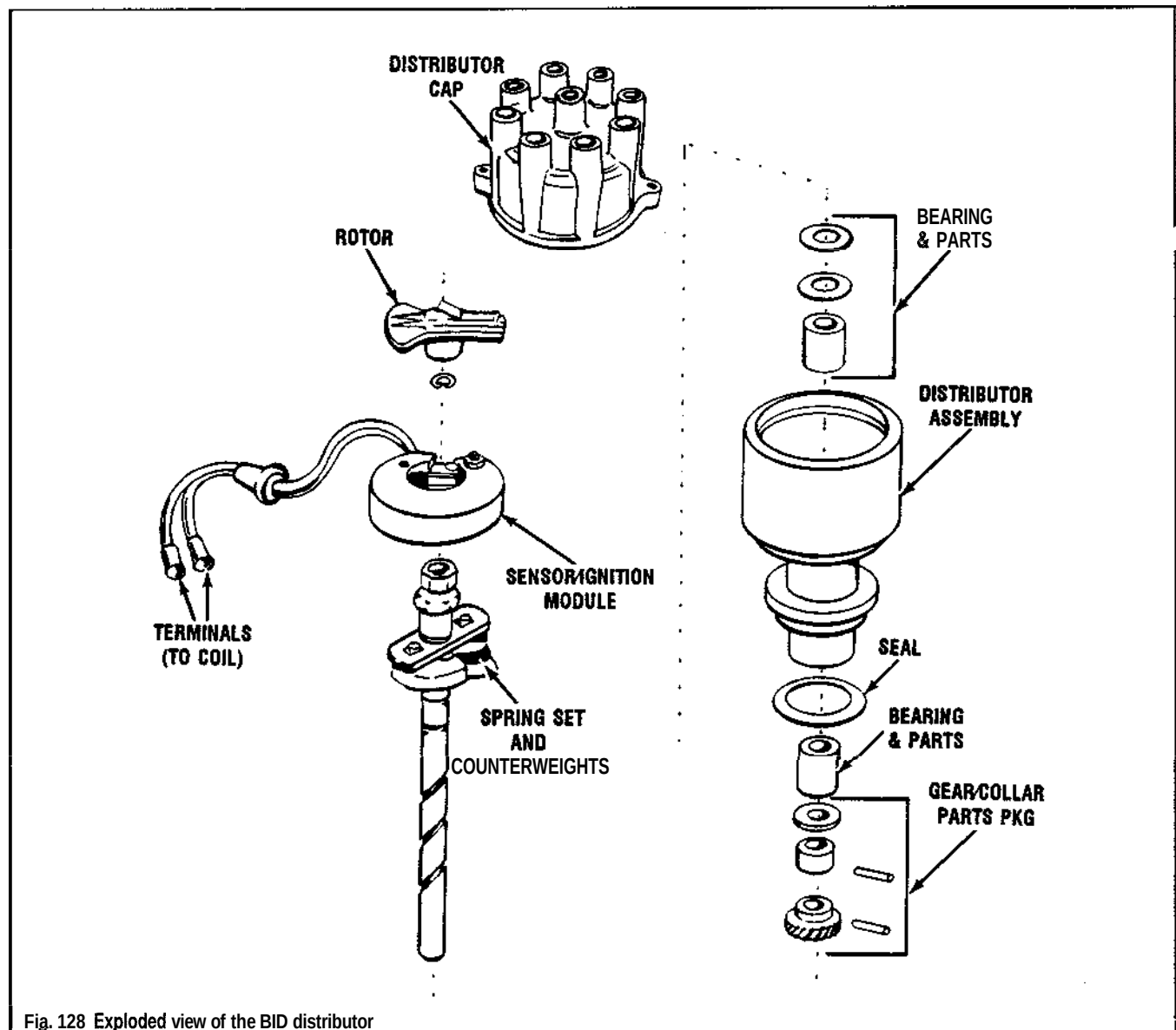


Fig. 128 Exploded view of the BID distributor

Clean loose corrosion from the terminal segments inside the cap. Do not use emery cloth or sandpaper. If the segments are deeply grooved, a new cap should be installed.

Inspect the terminal sockets for corrosion. Clean the sockets using a stiff wire brush to loosen the corrosion. After the sockets are clean, lubricate them with wheel bearing grease, or equivalent.

Inspect the rotor for cracks. Check to be sure the tip of the rotor is not badly burned. Such a condition demands the rotor be replaced.

Inspect the trigger wheel for any sign of contact with the sensor. If the distributor has been removed from the block, make an attempt to check the distributor shaft for excessive wear between the shaft and the bushings in the housing.

ASSEMBLY

◆ See Figures 123,128,129 and 130

The following procedures pickup the work after disassembled parts have been cleaned and replacement items have been obtained and are on hand.

1. Coat the bottom side of the sensor housing with Heat Sink compound and then position the assembly into the distributor. Tighten the 2 mounting screws (with new lock-washers) securely. Bump the engine around until a tooth on the trigger wheel lines up with the mark on the sensor and then adjust the air gap.

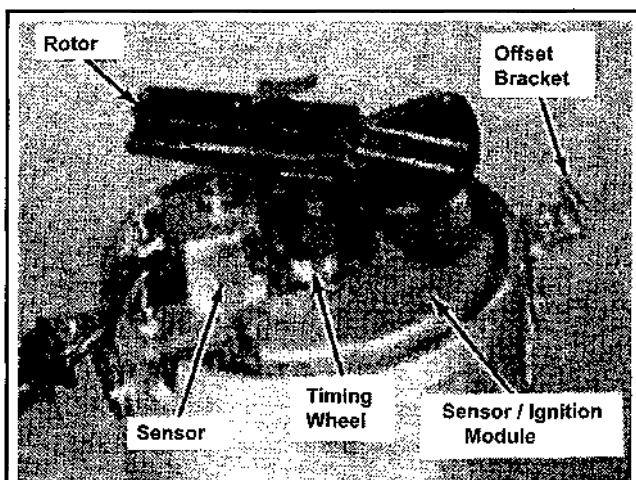


Fig. 129 Remove the rotor...

2. Connect the lead from the assembly to the coil and press the grommet back into the edge of the housing.

3. Align the rotor with the notch in the distributor shaft, and then press it to secure it in place.

4. Install the distributor.

Ignition Coil

REMOVAL & INSTALLATION



1. Disconnect the negative battery cable.
2. Disconnect the high tension lead coming from the distributor.
3. Tag and disconnect the coil electrical leads (two 2-pin connectors).
4. Remove the two coil mounting bolts and lift out the coil (with the bracket attached, if equipped).
5. Install the coil and tighten the mounting bolts to 20-25 ft. lbs. (27-34 Nm).
6. Connect the electrical leads and the high tension lead.
7. Connect the battery cable.

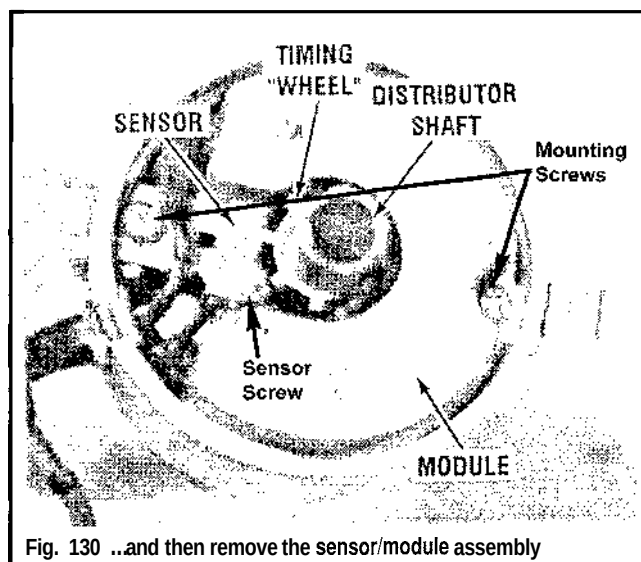


Fig. 130 ...and then remove the sensor/module assembly

SPLITFIRE/ELECTRONIC ENGINE MANAGEMENT (EMM) SYSTEM

Description & Operation

◆ See Figure 131

The Electronic Engine Management system is an electrical control system offering automatic monitoring and maintenance of a number of various circuits including the SLOW system (Speed Limiting Operational Warning), an engine speed limiter, a knock sensor, and variable spark advance.

The SLOW system is continually monitoring oil and water temperatures—emitting an audible warning when it detects low oil pressure or high water temperature. After sounding the alarm, the system will automatically, and gradually, reduce the engine speed by 200 rpm per second until it reaches 2800 rpm. Low oil pressure or overheating that occurs below 2800 rpm will set off the alarm, but NOT activate the system. The system is programmed with an automatic 5 second delay prior to activation in order to account for momentary loss of pressure during normal operation. The system will automatically shut itself off and reset upon engine shut-down.

The engine speed limiter, much like a governor, will shut off the signal to the ignition system when it detects an engine speed of 200 rpm above the programmed maximum limit. As soon as the engine speed drops back down into the allowable range, the system will de-activate and allow for normal engine operation.

A cylinder head-mounted knock sensor monitors for detonation or pre-ignition, gradually retarding spark advance until the condition is eliminated. Once activated, the system will maintain the retarded advance until the engine speed changes by more than 50 rpm. Once this happens, the system will gradually increase advance until the normal spark curve is achieved for the engine speed and operating conditions.

The system program provides two separate variable spark advance curves for the ignition module. The normal curve is for 89 AKI octane fuel and it uses the knock sensor to protect the engine and modify the curve in the case of lower octane fuels. There is also a default curve for 86 AKI octane fuel that works to protect the engine when lower octane fuel is detected and/or in the event of a defective knock sensor.

The system utilizes a breakerless electronic ignition system which requires no adjustments and almost no maintenance.

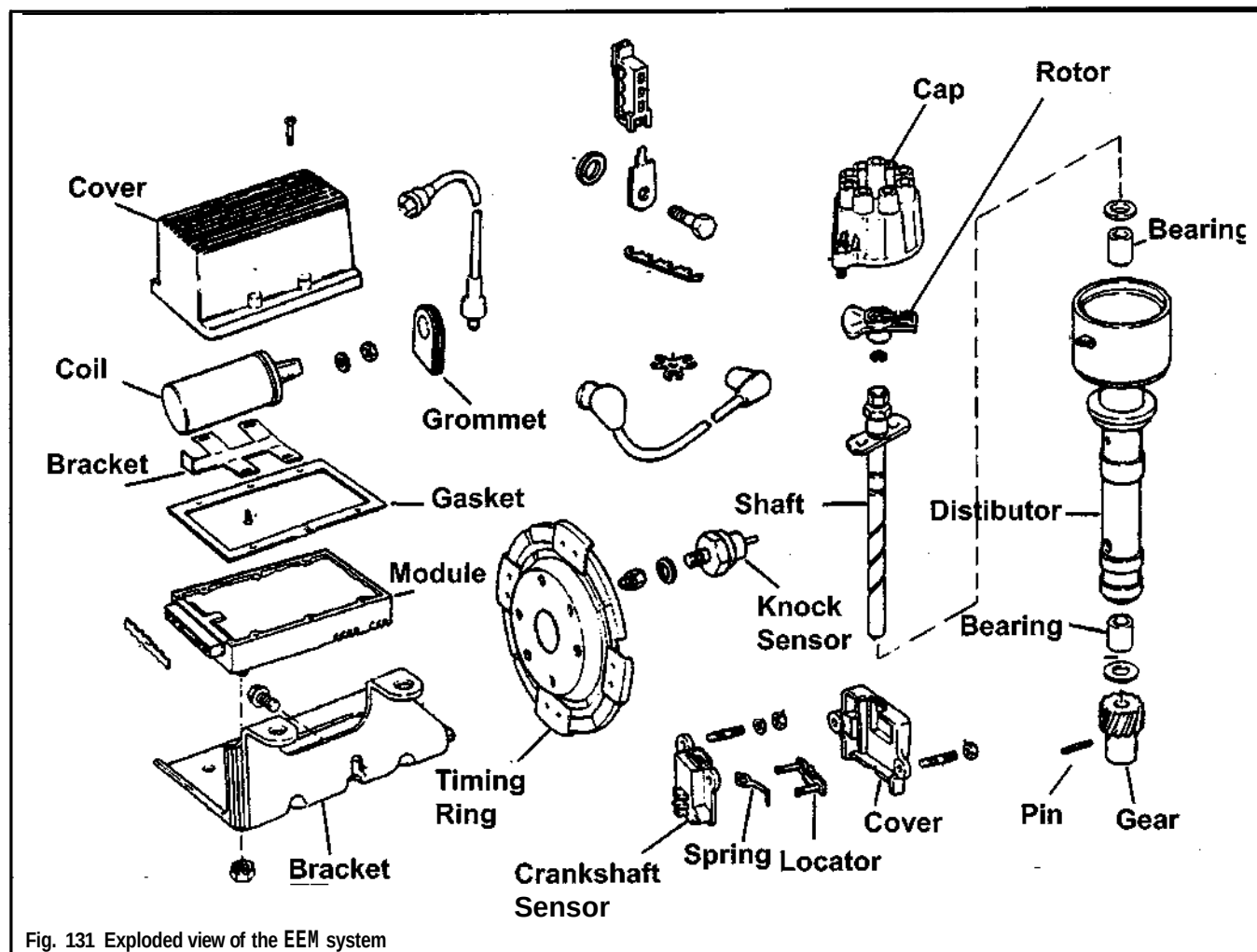


Fig. 131 Exploded view of the EEM system

System Components

COIL MODULE

The coil module is a large black housing, mounted on the inside of the Port exhaust high rise. It actually sits on top of the EEM module. The module contains one conventional 12V ignition coil.

1. Locate the module assembly and remove the screw securing the 14-pin connector on the side of the EEM module.
2. Remove the coil high tension lead and then pop the two modules out of their retaining bracket.
3. Separate the coil module from the EEM module by removing the six T25 Torx® screws. Carefully lay the coil housing to the side and remove the 4 coil bracket screws. Tag and disconnect the EEM electrical leads running to the coil. Slide the coil tower grommet out of the housing and off the tower. Remove the coil.
4. Connect an ohmmeter as per the manufacturer's instructions and set it to the low scale. Attach the meter leads to the two coil terminals. Check that the meter reads 1.26-1.54 ohms.
5. Now switch the meter to the high scale and attach one of the meter leads to either of the two coil terminals. Connect the other meter lead to the inside of the high tension tower. Correct resistance is 9400-11000 ohms.
6. Meter readings outside of the suggested ranges will necessitate replacement of the coil.
7. Reconnect the EEM module leads to the coil—if you neglected to tag them, the blue lead goes to the positive terminal and the yellow lead goes to the negative terminal.
8. Slide the grommet over the high tension tower and then position the coil into the housing while slipping in the grommet. Install the mounting bracket and tighten the screws securely.

□ The coil grommet must completely seal off the opening in the housing when installed.

9. Position the coil module over the EEM module and tighten the screws securely.

10. Install the assembly into the mounting bracket and plug in the connector. Install the retaining screw and tighten it securely.

DISTRIBUTOR



1. Begin by disconnecting the high tension leads from the distributor. Take time to identify and tag each lead as an aid during installation to ensure they are properly installed for correct cylinder firing.
2. Rotate the crankshaft until No. 1 cylinder is in the firing position—both valves for No. 1 are closed and the timing mark (or pointer) on the harmonic balancer is aligned with the 0° mark on the grid attached to the front cover.
3. Remove the two screws securing the distributor cap in place, and then remove the cap.
4. Now, note the position of the rotor tip. Take time to make a reference mark on the distributor housing to enable the rotor and the housing to be properly aligned during installation.
5. Make a mark on the distributor base and a matching mark on the engine/intake manifold as an aid during installation to ensure the distributor will be installed back in its original position.

□ Take care to prevent the crankshaft from being rotated—even slightly—while the distributor is out of the block.

6. Remove the distributor clamp bolt and lift the distributor straight up and clear of the engine. The gasket should be discarded.
7. Install the rotor and rotate it approximately 1/8 turn counterclockwise from the reference mark made prior to disassembling on GM engines; if the engine you're working on is a Ford, rotate the rotor 1/8 turn clockwise. Rotor rotation at this time is necessary because as the distributor shaft gear indexes with the camshaft gear, the shaft will rotate clockwise about 118 turn—the rotor will then be back where it should be for the No. 1 cylinder to fire.

8. Position a new distributor gasket in place on the engine. A reference mark should have been made on the distributor and the block prior to removal, as instructed in the removal procedures. Install the distributor into the block with the mark on the distributor roughly aligned with the mark on the block. On GM engines, the mark should be at the 10:00 position; while on Ford engines, the mark should be at the 8:00 position. Push the distributor fully into the block until the housing is seated.

9. If necessary, rotate the distributor housing slightly until the marks on the rotor and housing are in exact alignment.

10. Secure the distributor in place with the hold down clamp and bolt. Tighten the bolt to the proper specification as detailed in the Torque Specifications chart for your particular engine (snug, but no more than 20 ft. lbs.).

11. Install the cap and tighten the screws securely. The cap can only be installed properly—one way. Lubricate the sockets in the distributor cap with Extreme Pressure grease, or the equivalent. Install the spark plug high tension leads (if they were removed) using the identification made during removal to ensure proper cylinder firing.

EEM MODULE

The EEM module is located underneath the coil module on a bracket attached to the Port exhaust riser. It monitors and controls all EEM functions as previously described.

1. Locate the module assembly and remove the screw securing the 14-pin connector on the side of the EEM module.
2. Remove the coil high tension lead and then pop the two modules out of their retaining bracket.
3. Separate the coil module from the EEM module by removing the six

T25 Torx® screws. Carefully lay the coil housing to the side and then tag and disconnect the EEM electrical leads running to the coil. Position the coil module to the side.

4. Reconnect the EEM module leads to the coil — if you neglected to tag them, the blue lead goes to the positive terminal and the yellow lead goes to the negative terminal.

5. Position the coil module over the EEM module and tighten the screws securely.

6. Install the assembly into the mounting bracket and plug in the connector. Install the retaining screw and tighten it securely.

KNOCK SENSOR

The knock sensor is mounted at the rear of the cylinder head. When removing, disconnect the electrical lead and carefully unscrew the sensor—never use an impact wrench. Since the sensor grounds it self to the engine through its threads, make certain that the threads on both the sensor and the head are clean and debris-free. Tighten to 7-10 ft. lbs. (9.5-13.5 Nm), being VERY careful not to over-tighten it.

TIMING RING

A timing ring is mounted on the crankshaft between the flywheel and the engine coupler. The ring has four outer vanes which are used to notify the EEM module of the correct timing for firing of each cylinder. An inner ring is also utilized as a 'start-up' reference for the No. 1 cylinder. Removal and installation procedures are contained with the Engine Mechanical section.

TIMING SENSOR

The timing sensor is mounted on the upper flywheel housing, on the Port side. This is a very simple electronic switching device, receiving power and ground through the EEM module. Two Hall Effect switches inside the sensor sense the timing ring movement and send an electrical impulse back to the module which uses these signals to control ignition system operation. Removal and installation of the sensor is a **snap**, but is also detailed in the appropriate Engine Mechanical section (usually in the Flywheel/Coupler procedures).

FORD THICK FILM INTEGRATED IGNITION SYSTEM (TFI-IV)

Description & Operation

◆ See Figure 132 and 133

The TFI-IV system, part of a greater system called Electronic Engine Control System 4th generation (EEC-IV) is used on all fuel injected Ford engines. This is an electronic engine control system consisting of a network of electronic and electro-mechanical components that continuously vary engine operation to meet pre-programmed operating parameters.

The heart of the system is a "black box" called an electronic control assembly (ECA). The ECA is linked to all of the system components by the wiring harness and is sealed against dirt and moisture. The ECA monitors and controls all engine operating conditions through various sensor inputs and via its own command outputs. All operating parameters are pre-programmed and dependant on engine size and operating conditions.

The TFI-IV ignition system used with the EEC-IV system utilizes the following major components: distributor, ECA, TFI module and coil.

The distributor is driven by a drive gear on the camshaft and a driven gear attached to the lower end of the distributor shaft. At the upper end of the distributor, a rotary vane cup rotates with the distributor. Electrically, the distributor utilizes a Hall Effect vane switched On and Off by the ECA. The vane assembly is a Hall sensor on one side and a permanent magnet on the other. The rotary vane cup, made of a ferrous metal, triggers the signals. When an opening in the vane cup moves in front of the magnet and sensor, a magnetic flux field is completed from the magnet, through the Hall sensor, and back to the magnet.

As the vane cup rotates and closes the window opening, the flux lines are shunted through the vane and back to the magnet. During this time, voltage is produced as the vane passes through the window opening. When the vane clears the opening, the window edge causes the signal to go to 0 volts. This pulsed signal is called the Profile Ignition Pickup signal, or PIP signal. One window of the vane cup is a different size from the others and is used

for crankshaft positioning and engine speed information by the ECA. This signal is known as the "Signature PIP". The distributor uses no centrifugal weights or vacuum advance motors since spark is controlled by the ECA. With the exception of a base timing adjustment, no adjustments are necessary.

The two PIP signals provide the ECA with engine speed and crankshaft positioning information. This information is processed by the processor within the ECA and sends out a Spark Output, abbreviated SPOUT, signal to the TFI module.

The TFI-IV module composed of a custom integrated circuit, a Darlington output device and associated thick film integrated components. The module is mounted remotely on a heat sink next to the ignition coil. When commended by the SPOUT signal from the ECA, it opens and closes the ignition coil primary circuit to produce the secondary spark output from the coil to the distributor and on to the spark plugs.

The module is controlled, and spark timing adjustment is made, by the timed SPOUT signal from the ECA. In the event of no SPOUT signal, such as during base timing adjustment or an ECA failure, a second PIP signal from the Hall Effect switch in the distributor is sent to the module and will provide a base timing specification for engine operation. The SPOUT circuit includes a connector on the wiring harness which is removed when setting base timing. The TFI module also incorporates an Ignition Diagnostic Monitor (IDM) circuit which provides the ECA with an rpm reference signal. Failure of the IDM circuit will store a service code in the memory of the ECA.

The ignition coil is remotely mounted next to the TFI module and is commonly referred to as the E-Coil or E-Core coil. The coil consists of an externally wound lamination around an iron core and is epoxy-filled to resist heat, moisture and vibration. The coil is small in size but capable of delivering 38Kv at maximum output.

Power for the E-coil is provided from the ECA through the wiring harness connecting to the positive terminal on the coil. The negative side of the coil is connected to the TFI module; thus completing the primary side of the ignition circuit. The TFI module will turn the primary current flow ON when there is no

SPOUT signal. Current flow is turned OFF as commanded by the SPOUT signal. When the primary current field collapses, a high voltage output is generated in the secondary windings, delivered to the distributor and then on to the spark plugs.

The knock sensor is simply a signal generating device that detects engine detonation (knock) and converts this frequency signal into voltage through the use of a piezo-element mounted in a threaded metal housing. Special construction makes the element only sensitive to the particular engine vibrations associated with spark knock.

When spark knock occurs, the knock sensor produces a low voltage pulsing electrical signal that is then amplified in the knock module. The signal is then sent to the ECA which will then retard the ignition timing in three steps until the knock is no longer sensed, or the retard reaches a maximum of 8°. Normal spark advance will return after the MAP sensor detects a 3-4 in. Hg. change in engine vacuum.

The SLOW operational system is designed to protect the engine from damage should it lose oil pressure or experience excessively high coolant temperature. This system will activate automatically without operator action. The condition can be verified by checking either the oil or temperature gauges. In the event of a high coolant temperature (200°F and above), or low oil pressure (less than 5 psi), the coolant temperature switch or the oil pressure switch will ground a low voltage signal in the ECA. The ECA will then begin to alter the fuel injector firing sequence, causing the engine to run rough and eventually bringing the engine speed below 2700 rpm. Once below 2700 rpm, the engine will run smoothly but be limited to a max of 2700 rpm by the ECA. The engine will remain in this SLOW operational mode until such a time as the problem is corrected or the temperature/psi moves back into the normal range. If the vessel is equipped with an Audible Alarm option, a warning horn will sound as soon as the engine enters the SLOW mode.

Engine speed limiter operation is controlled by, you guessed it, the ECA. Sensor operation, such as the rpm data from the PIP signal, is also monitored by the ECA. If engine speed exceeds the programmed maximum by 400 rpm, the speed limiter circuit will be activated, effectively halting all fuel injector firing until the engine speed falls back within the allowable limits. Once engine speed is back below the limit, the speed limiting circuit will be de-activated and injector firing will resume.

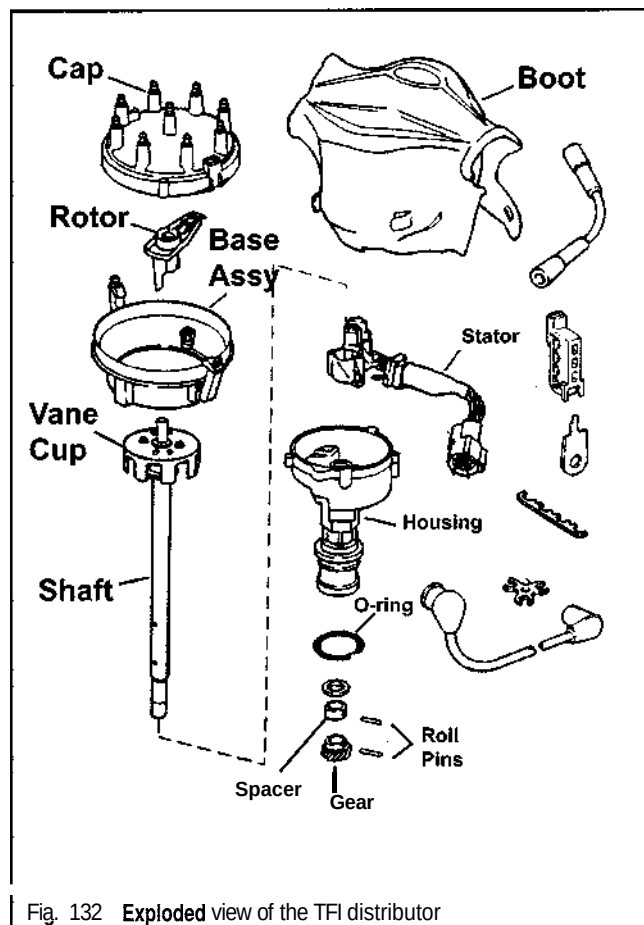


Fig. 132 Exploded view of the TFI distributor

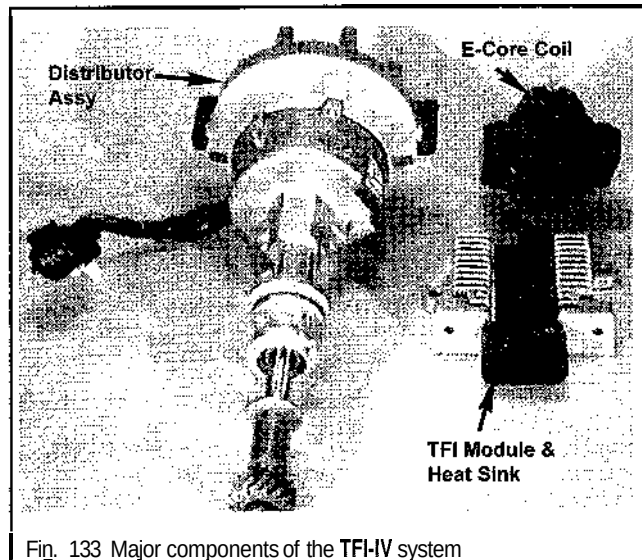


Fig. 133 Major components of the TFI-IV system

Distributor Cap

REMOVAL & INSTALLATION

◆ See Figure 134



□ It is not necessary to remove the spark plug leads at the cap when removing it. If you do remove them, be sure to tag each of them to ensure correct installation.

1. Disconnect the battery cables.
2. Remove the plastic engine cover and then remove the rubber boot covering the distributor.
3. Remove the distributor cap mounting screws and lift off the cap. Some caps may have a vent connection; if yours does, unplug the hose.
4. Clean the cap with warm soapy water—if you have not removed the spark plug wires, you must, obviously, do it at this time. Blow it dry with compressed air; or if not available, make sure it air dries completely prior to installation.
5. Check the cap contacts for excessive burning, wear or corrosion. Check the cap for cracks or wear.
6. Install the cap and note the square alignment locator. Tighten the screws to 18-23 inch lbs. (2.0-2.6 Nm). Reconnect the plug wires if disconnected.
7. Install the rubber boot and the plastic engine cover. Reconnect the battery cables.

Distributor

REMOVAL & INSTALLATION



1. Begin by disconnecting the high tension leads from the distributor. Take time to identify and tag each lead as an aid during installation to ensure they are properly installed for correct cylinder firing.
2. Rotate the crankshaft until No. 1 cylinder is in the firing position—both valves for No. 1 are closed and the timing mark (or pointer) on the harmonic balancer is aligned with the 0° mark on the grid attached to the front cover.
3. Remove the two screws securing the distributor cap in place, and then remove the cap.
4. Now, note the position of the rotor tip. Take time to make a reference mark on the distributor housing to enable the rotor and the housing to be properly aligned during installation.
5. Push in on the tab and disconnect the 8-pin connector from the side of the housing.
6. Make a mark on the distributor base and a matching mark on the engine as an aid during installation to ensure the distributor will be installed back in its original position.

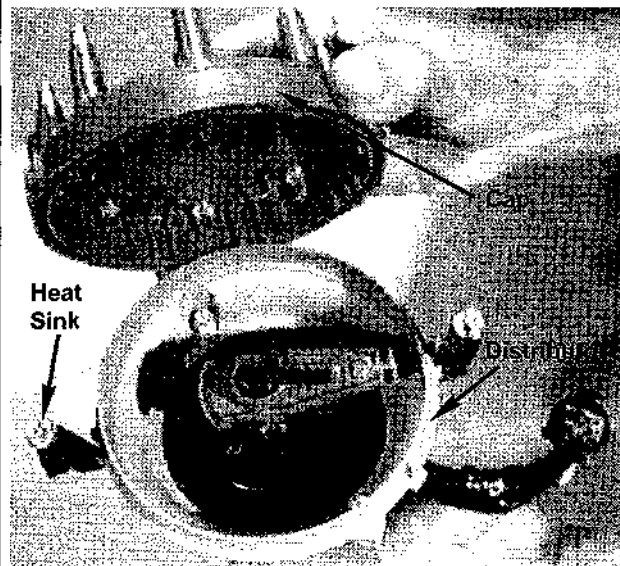


Fig. 134 Removing the distributor cap

■ Take care to prevent the crankshaft from being rotated—even slightly—while the distributor is out of the block. If the crankshaft should be rotated—follow the procedures listed under Engine Disturbed later in this section.

7. Remove the distributor clamp bolt and lift the distributor straight up and clear of the engine. The gasket should be discarded.

To Install:

□ When installing a new distributor, make sure that you add Ford Engine Oil Supplement to the oil before starting the engine for the first time.

8. Insure that the No. 1 piston is at TDC of the compression stroke—make sure that the timing pointer is aligned with the TDC mark on the damper timing scale.

9. Rotate the shaft of the distributor so that the tip of the rotor is aligned with the mark on the housing made previously.

10. Lubricate the distributor drive gear lightly with engine oil and install the unit into the engine. Rotate the distributor shaft as you are inserting the unit so that the leading edge of a vane is centered in the stator assembly.

11. Rotate the distributor in the block again to ensure that the vane is centered on the stator and the rotor is pointing directly at the mark. If you cannot get the vane and stator to align correctly, lift the unit out of the block just enough so that the drive gear disengages with the camshaft gear, rotate the shaft slightly so that it engages with another tooth, and then reinsert the unit back into the block and repeat the alignment process.

■ If you have difficulty getting the oil pump shaft to engage with the distributor shaft, drop a little dab of grease on the end of the oil pump shaft after positioning it in the center of the opening and then reinstall the distributor.

12. Install the hold-down clamp and tighten the bolt finger-tight.

13. Coat the 8-pin connector with Electric Terminal grease and then plug it into the housing.

14. Install the distributor cap and slide on the rubber boot.

15. Position the shift lever in the NEUTRAL position and install a variable advance inductive timing light as per the manufacturer's instructions.

16. Start the engine and allow it to reach normal operating temperature.

17. Remove the shorting bar from the 2-wire SPOUT connector located in the wiring harness next to the distributor.

18. With the engine idling, shine the timing light at the marks and slowly rotate the distributor until initial timing is 5° BTDC.

19. Coat the terminals with Electric Terminal grease and reinstall the shorting bar to the SPOUT connector. Confirm that the timing is advanced past the original setting.

20. Remove the timing light and tighten the clamp bolt to 17-25 ft. lbs. (23-34 Nm).

21. Recheck the timing and adjust as necessary.

REMOVAL & INSTALLATION



◆ See Figures 132 and 135 thru 141

1. Remove the distributor cap and pull off the rotor.
2. Remove the distributor.
3. Loosen the two captive screws that secure the base adapter to the distributor housing and lift off the base assembly.
4. Use a magic marker or a little paint and mark the rotary vane cup and the distributor gear to confirm their orientation during installation.
5. Hold the distributor gear and remove the 2 vane cup retaining screws. Lift off the vane cup.
6. Lay the distributor on its side and support the shaft end with a small piece of wood. Use a blunt-end punch and drive out the roll pins holding the distributor gear and the spacer to the shaft.
7. Install a universal bearing separator over the gear and install the inverted assembly into an arbor press. Install Bearing Removal Tool (#D84L-950-A) or the equivalent and then press the distributor shaft out of the gear—make sure to hold the unit as it's coming out of the gear.
8. Clean all oil residue and dirt from the shaft. Use a piece of emery cloth to polish the shaft and remove any burrs. Slide the spacer off of the shaft if possible; otherwise, install the assembly back into the press and drive it off as you did the gear. Make sure that the bearing separator is between the distributor housing and the spacer.
9. Slide the distributor shaft out of the housing. Remove the screw from the stator lead and retainer and lift out the stator retainer.
10. Carefully pry the stator lead out of the cut-out in the side of the distributor housing and then lift the stator assembly up and free of the center flange.

To Install:

✖✖ CAUTION

Never clean any electrical components in a petroleum-based solvent.

11. Inspect the bushing in the distributor base for signs of wear or damage—the bushing is not a separate component, so the entire distributor assembly must be replaced.

12. Inspect the O-ring for wear or damage, replace as necessary.

13. Clean all electrical components with contact cleaner.

14. Inspect the stator for damaged wires, loose pins and/or cracked connectors. Replace the assembly if damaged or defective.

15. Position the stator over the center flange bushing and press it into place. Slide the harness into its cut-out in the housing and then install the retainer. Tighten the screws to 15-35 inch lbs. (1.7-4.0 Nm).

16. Lubricate the bushing and shaft seal with clean engine oil and then slide the shaft down and through the housing.

17. Slide the spacer onto the bottom of the shaft so the flange is facing the housing. Align the roll pin hole in the spacer with the hole in the shaft and then press it into place with a suitable sized mandrel. Make sure that the two holes are lined up and then press in the roll pin.

18. Slide the drive gear onto the bottom of the shaft so the flange is facing the spacer. Align the roll pin hole in the gear flange with the hole in the shaft and then press it into place with a suitable sized mandrel. Make sure that the two holes are lined up and then press in the roll pin.

If the holes in the spacer or gear do not line up with the holes in the shaft, DO NOT attempt to force them into alignment by inserting a punch or similar instrument. Remove them and then start over.

19. Turn the distributor upright and position the rotary vane cup onto the upper end of the distributor shaft so the notches in the cup align with those in the shaft flange. Install the retaining screws and tighten them to 25-35 inch lbs. (2.8-4.0 Nm). Spin the distributor shaft a few times to check for smooth rotation and a lack of binding. Make sure that the vane cup does not come in contact with the stator—replace the distributor if it does.

20. Align the notch on the base adapter with the notch in the housing, install the screws and tighten them securely.

21. Slide the rotor into position so that the index leg of the rotor engages the notch in the rotary vane cup.

22. Install the distributor cap and then install the distributor. Check and adjust the timing.

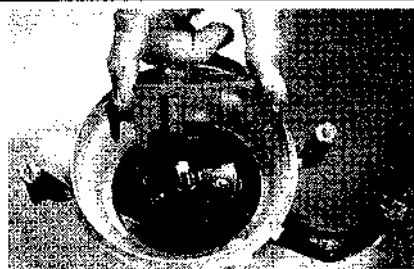


Fig. 135 Remove the rotor...

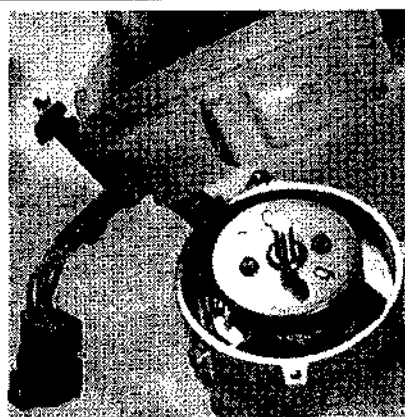


Fig. 136 ...and then remove the adapter base

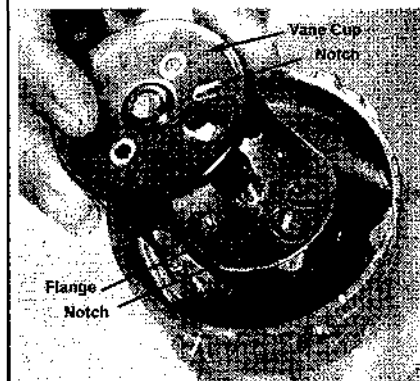


Fig. 137 Lifting out the rotary vane cup

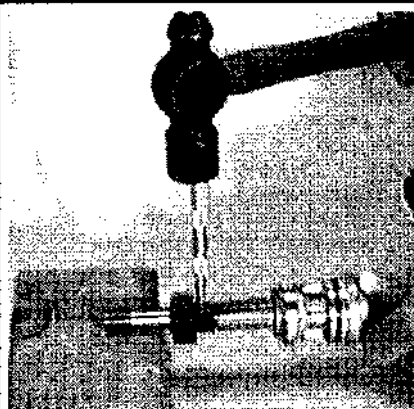


Fig. 138 Drive out the roll pins with a hammer and drift

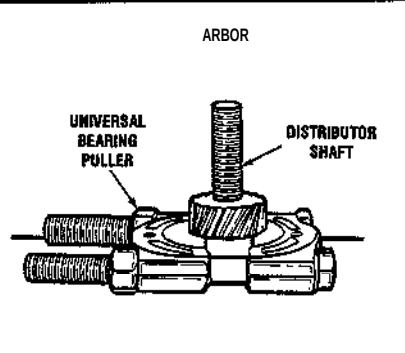


Fig. 139 An arbor press is necessary when removing the drive gear.

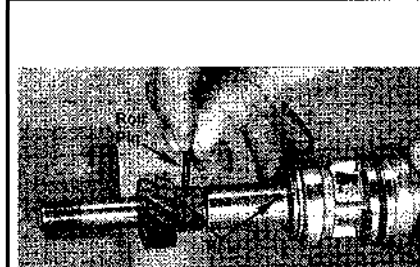


Fig. 140 Make sure that the holes are aligned before pressing in the roll pin

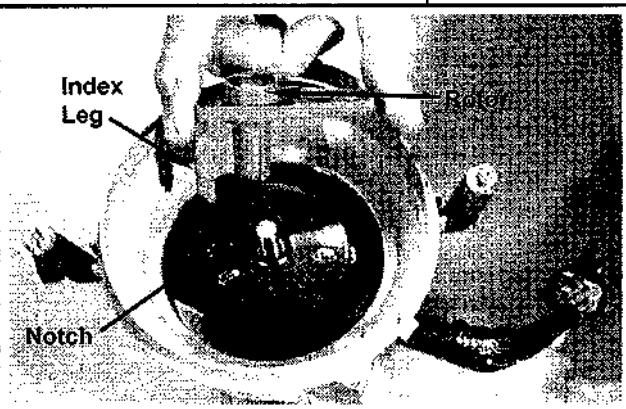


Fig. 141 Insert the index leg into the notch in the vane cup

E-Core Coil

REMOVAL & INSTALLATION

1. Disconnect the battery cables.
2. Remove the plastic engine cover and then wiggle the high tension lead off of the coil.
3. Insert a very small screwdriver under the lock clip on the side of the coil and pry it out to release the electrical connector.
4. Remove the 2 large bolts (on top) securing the coil to the TFI bracket. Remove the 2 small bolts (on the side) and lift off the coil and coil bracket.



To Install:

5. Position the coil and bracket onto the TFI bracket and tighten the small bolts to 24-36 inch lbs. (2.7-4.1 Nm). Install the larger bolts through the top and tighten them to 60-84 inch lbs. (6.8-9.5 Nm).
6. Coat the connector terminals with Electrical Terminal grease and plug in the connector until the locking latch snaps into place.
7. Coat the coil lead and terminal lightly with wheel bearing grease and connect the lead to the terminal.
8. Install the engine cover, connect the battery cables, start the engine and check for proper operation.

TESTING



◆ See Figures 142, 143 and 144

1. Connect a multi-meter as per the manufacturer's instructions.
2. Connect the meter leads between the positive coil terminal and the secondary terminal. Secondary circuit resistance should be 7600-9400 ohms. Test A.
3. Connect the meter leads between the negative coil terminal and the secondary terminal. Secondary circuit resistance should be 7600-9400 ohms. Test A.
4. Connect the meter leads between the negative coil terminal and the positive terminal. Primary circuit resistance should be 0.39-0.42 ohms.
5. Connect the meter leads between the positive terminal and the coil case ground. The meter should show infinity. Test B.
6. Connect the meter leads between the secondary terminal and the coil case ground. The meter should show infinity. Test C.
7. Any readings not within the ranges given will indicate the need to replace the coil.

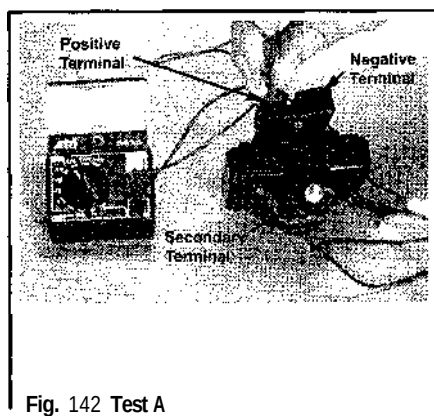


Fig. 142 Test A

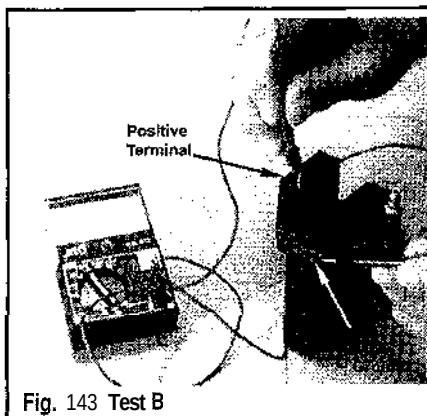


Fig. 143 Test B

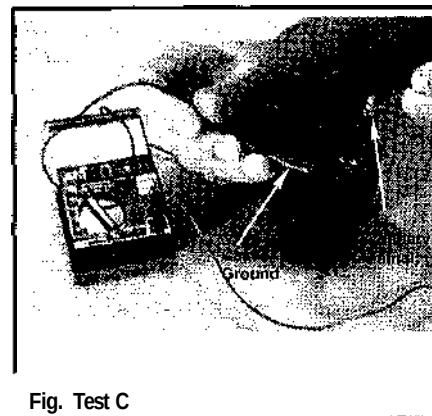


Fig. Test C

TFI Module

REMOVAL & INSTALLATION

◆ See Figure 145

1. Disconnect the battery cables.
2. Remove the plastic engine cover and then wiggle the high tension lead off of the coil.
3. Remove the E-coil.
4. Grasp the sides of the module connector, push in on each side clip while pulling on the body of the connector and then remove the connector.
5. Remove the 2 mounting bolts and lift off the module assembly. Remove the 2 bolts securing the module to the heat sink and separate the two.

To Install:

6. Coat the back of the module with a 1132 in. (0.79mm) thick layer of Heat Sink Compound, position the module to the heat sink, and then tighten the screws to 24-36 inch lbs. (2.7-4.1 Nm).
7. Position the assembly on the bracket and tighten the bolts to 60-84 inch lbs. (6.8-9.5 Nm).
8. Coat the connector terminals with Electric Terminal grease and push the two connectors together so that the latches lock into position.
9. Install the E-coil. Install the engine cover and connect the battery cables.
10. Start the engine and adjust the initial timing if necessary

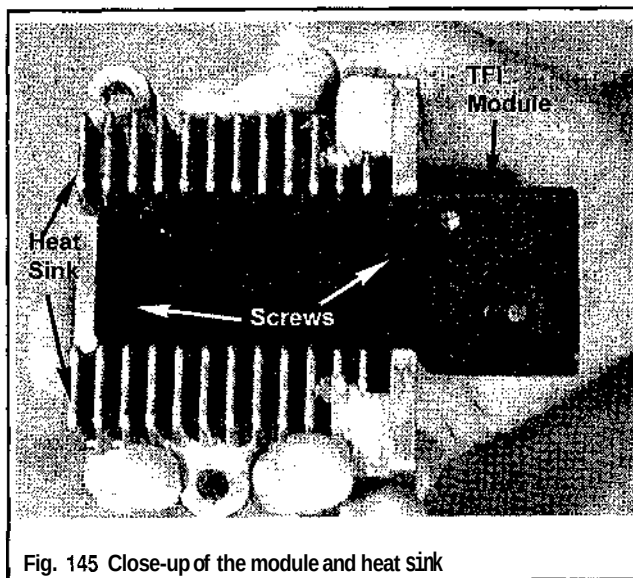


Fig. 145 Close-up of the module and heat sink

INSTRUMENTS AND GAUGES

Oil And Temperature Gauges

TROUBLESHOOTING

◆ See Figure 146



The body of oil and temperature gauges must be grounded and they must be supplied with 12 volts. Many gauges have a terminal on the mounting bracket for attaching a ground wire. A tang from the mounting bracket makes contact with the gauge. Check to be sure the tang does make good contact with the gauge.

Ground the wire to the sending unit and the needle of the gauge should move to the full right position indicating the gauge is in serviceable condition.

Check the sender unit for a defective temperature warning system.

If a problem arises on a boat equipped with water, temperature, and oil pressure lights, the first area to check is the light assembly for loose wires or burned-out bulbs.

When the ignition key is turned to the **ON** position, the light assembly is supplied with 12 volts and grounded through the sending unit mounted on the engine. When the sending unit makes contact because the water temperature is too hot or the oil pressure is too low, the circuit to ground is completed and the lamp should light.

To check the bulb: turn the ignition switch to the **ON** position. Disconnect the wire at the sending unit, and then ground the wire. The lamp on the dash should light. If it does not light, check for a burned-out bulb or a break in the wiring to the light.

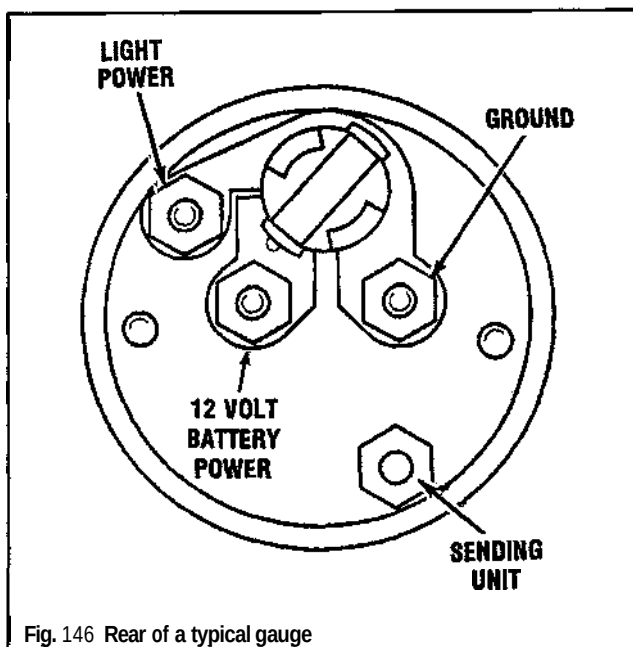


Fig. 146 Rear of a typical gauge

TESTING



1. With the ignition switch in the **OFF** position, remove the wire to the sending unit.
2. Turn the ignition switch to the **RUN** position and confirm that the gauge needle is seated on the post at the left side; or all the way to the left of the scale if there is no post.
3. Turn the ignition switch **OFF** again and connect a jumper wire between the ground terminal and the sending unit terminal.
4. Turn the ignition switch back to the **RUN** position and confirm that the gauge needle is seated on the post at the right side; or all the way to the right of the scale if there is no post.
5. Replace the gauge if anything fails.

REMOVAL & INSTALLATION



1. Disconnect the battery cables.
2. Tag and disconnect the electrical leads at the back of the gauge.
3. Disconnect the light socket, remove the holding strap and lift out the gauge.

To Install:

4. Position the gauge into the mounting hole, install the strap and tighten the nuts securely.

■ **Be careful not to tighten the holding strap too tightly or you risk distorting the gauge casing.**

5. Connect the ground wire and then connect the remaining leads.
6. Install the light socket and then coat all terminal connections with liquid neoprene or equivalent.
7. Connect the battery cables.

Fuel Gauge

HOOKUP



The Boating Industry Association recommends the following color coding be used on all fuel gauge installations:

- Black—for all grounded current-carrying conductors.
 - Pink—insulated wire from the fuel gauge sending unit to the gauge.
 - Red—insulated wire for a connection from the positive side of the battery to any electrical equipment.
1. Connect one end of a pink insulated wire to the terminal on the gauge marked **TANK** and the other end to the terminal on top of the tank unit.
 2. Connect one end of a black wire to the terminal on the fuel gauge marked **IGN** and the other end to the ignition switch.
 3. Connect one end of a second black wire to the fuel gauge terminal marked **GRD** and the other end to a good ground. It is important for the fuel gauge case to have a good common ground with the tank unit. Aboard an all-metal boat, this ground wire is not necessary. However, if the dashboard is insulated, or made of wood or plastic, a wire must be run from the gauge ground terminal to one of the bolts securing the sending unit in the fuel tank, and then from there to the negative side of the battery.

TROUBLESHOOTING



In order for the fuel gauge to operate properly the sending unit and the receiving unit must be of the same type and preferably of the same make. The following symptoms and possible corrective actions will be helpful in restoring a faulty fuel gauge circuit to proper operation.

If you suspect the gauge is not operating properly, the first area to check is all electrical connections from one end to the other. Be sure they are clean and tight. Next, check the common ground wire between the negative side of the battery, the fuel tank, and the gauge on the dash.

If all wires and connections in the circuit are in good condition, check the sending unit.

If the pointer does not move from the empty position one of four faults could be to blame:

1. The dash receiving unit is not properly grounded.
2. No voltage at the dash receiving unit.
3. Negative meter connections are on a positive grounded system.
4. Positive meter connections are on a negative grounded system.

If the pointer fails to move from the full position, the problem could be one of three faults.

5. The tank sending unit is not properly grounded.
6. Improper connection between the tank sending unit and the receiving unit on the dash.
7. The wire from the gauge to the ignition switch is connected at the wrong terminal.

If the pointer remains at the $\frac{3}{4}$ full mark, it indicates a six-volt gauge is installed in a 12-volt system.

If the pointer remains at about $\frac{1}{4}$ full, it indicates a 12-volt gauge is installed in a six-volt system.

Erratic Fuel Gauge Readings

Inspect all of the wiring in the circuit for possible damage to the insulation or conductor. Carefully check:

1. Ground connections at the receiving unit on the dash.
2. Harness connector to the dash unit.
3. Body harness connector to the chassis harness.
4. Ground connection from the fuel tank to the trunk floor pan.
5. Feed wire connection at the tank sending unit.

Gauge Always Reads Full—When Ignition Switch Is In ON Position

1. Check the electrical connections at the receiving unit on the dash; the body harness connector to chassis harness connector; and the tank unit connector in the tank.
2. Make a continuity check of the ground wire from the tank to the tank floor pan.
3. Connect a known good tank unit to the tank feed wire and the ground lead. Raise and lower the float and observe the receiving unit on the dash. If the dash unit follows the arm movement, replace the tank sending unit.

Gauge Always Reads Empty—When Ignition Switch Is In ON Position

Disconnect the tank unit feed wire and do not allow the wire terminal to ground. The gauge on the dash should read full.

If Gauge Reads Empty

1. Connect a spare control unit into the control unit harness connector and ground the unit. If the spare unit reads full, the original unit is shorted and must be replaced.
2. A reading of empty indicates a short in the harness between the tank sending unit and the gauge on the control panel.

If Gauge Reads Full

1. Connect a known good tank sending unit to the tank feed wire and the ground lead.
2. Raise and lower the float while observing the gauge on the control panel. If the control panel gauge follows movement of the float, replace the tank sending unit.

Gauge Never Reads Full

This test requires shop test equipment.

1. Disconnect the feed wire to the tank unit and connect the wire to ground thru a variable resistor or thru a spare tank unit.
2. Observe the control panel gauge reading. The reading should be full when resistance is increased to about 90 ohms. This resistance would simulate a full tank.
3. If the check indicates the control panel gauge is operating properly, the trouble is either in the tank sending unit rheostat being shorter, or the float is binding. The arm could be bent, or the tank may be deformed. Inspect and correct the problem.

TESTING



1. With the ignition switch in the **OFF** position, remove the wire to the sending unit (lower right, looking at the back of the gauge).
2. Turn the ignition switch to the **RUN** position and confirm that the gauge needle is seated on the post at the left side; or all the way to the left of the scale if there is no post.
3. Turn the ignition switch back to the **OFF** position and connect a jumper wire between the ground terminal (upper right from the back of gauge) and the sending unit terminal.
4. Turn the ignition switch to the **RUN** position again and confirm that the gauge needle is seated on the post at the right side or all the way to the right of the scale if there is no post.
5. Replace the gauge if anything fails.

REMOVAL & INSTALLATION



1. Disconnect the battery cables.
2. Tag and disconnect the electrical leads at the back of the gauge.
3. Disconnect the light socket, remove the holding strap and lift out the gauge.

To Install:

4. Position the gauge into the mounting hole, install the strap and tighten the nuts securely.

Be careful not to tighten the holding strap too tightly or you risk distorting the gauge casing.

5. Connect the ground wire and then connect the remaining leads.
6. Install the light socket and then coat all terminal connections with liquid neoprene or equivalent.
7. Connect the battery cables.

Battery Gauge

TESTING



1. Make sure that the battery is fully charged and then turn the ignition switch to the **RUN** position. The gauge should read battery voltage, otherwise replace it.
2. If the gauge is out of the dash, turn the ignition switch **OFF** and connect a jumper wire between the ground terminal (upper right looking at the back of the gauge) and the negative battery terminal. Connect another jumper between the power terminal (lower left looking at the back of the gauge) and the positive battery terminal. The gauge should register battery voltage, otherwise replace it.

REMOVAL & INSTALLATION



1. Disconnect the battery cables.
2. Tag and disconnect the electrical leads at the back of the gauge.
3. Disconnect the light socket, remove the holding strap and lift out the gauge.

To Install:

4. Position the gauge into the mounting hole, install the strap and tighten the nuts securely.

Be careful not to tighten the holding strap too tightly or you risk distorting the gauge casing.

5. Connect the ground wire and then connect the remaining leads.
6. Install the light socket and then coat all terminal connections with liquid neoprene or equivalent.
7. Connect the battery cables.

Speedometer

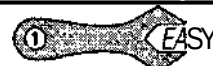
TESTING



An air compressor is necessary for this procedure. It is imperative that its pressure gauge is extremely accurate.

Disconnect the hose at the back of the gauge and then connect a line from an air compressor. Apply 5.3 psi of air pressure to the speedometer and check that the gauge reads 20 mph (+/- 1 mph). Now apply 27.8 psi pressure and check that the gauge reads 45 mph (+/- 1 mph). If either of the readings is not as specified, replace the speedometer.

REMOVAL & INSTALLATION



1. Disconnect the battery cables.
2. Tag and disconnect the electrical leads and the hose at the back of the gauge.
3. Disconnect the light socket, remove the holding strap and lift out the gauge.

To Install:

4. Position the gauge into the mounting hole, install the strap and tighten the nuts securely.

Be careful not to tighten the holding strap too tightly or you risk distorting the gauge casing.

5. Connect the ground wire and then connect the remaining leads. Connect the hose.
6. Install the light socket and then coat all terminal connections with liquid neoprene or equivalent.
7. Connect the battery cables.

Tachometer

TESTING



See Figure 147

Connect a tachometer as per the manufacturer's instructions. Start the engine and check a few different engine speeds on the boat's tachometer against the service tach. If using a 6000 rpm service tach, variations of **ti**-150 rpm are acceptable; if using an 8000 rpm tach, variations of +/- 200 rpm are acceptable. Replace the tachometer if not within specifications.

All tachometers supplied with OMC engines should have a small switch on the back of the unit to program it for the particular engine that it is connected to. Switch calibration is as follows:

- 4 cylinder engines—arrow points to position 2
- V6 engines—arrow points to position 3
- V8 engines—arrow points to position 4

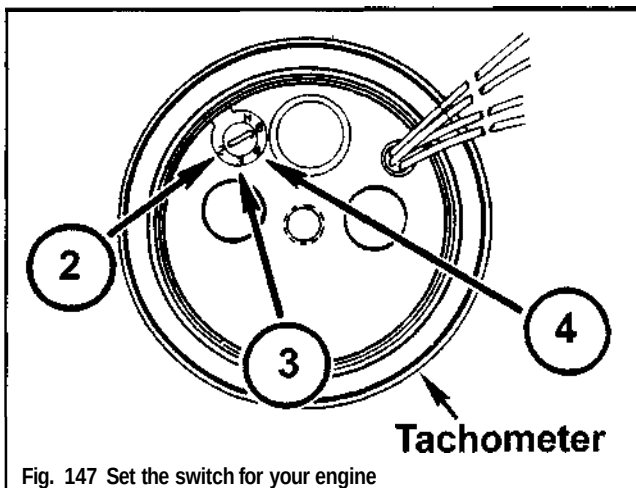


Fig. 147 Set the switch for your engine

??
Is
"pints"
correct
?

10-58 IGNITION AND ELECTRICAL SYSTEMS

REMOVAL & INSTALLATION

1. Disconnect the battery cables
2. Tag and disconnect the electrical leads at the back of the gauge
3. Disconnect the light socket, remove the holding strap and lift out the gauge.



To Install:

4. Position the gauge into the mounting hole, install the strap and tighten the nuts securely
- Be careful not to tighten the holding strap too tightly or you risk distorting the gauge casing.
5. Connect the ground wire and then connect the remaining leads.
6. Install the light socket and then coat all terminal connections with liquid neoprene or equivalent.
7. Connect the battery cables.

SENDING UNITS AND SWITCHES

Oil Pressure Sending Unit

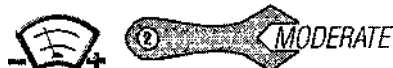
TESTING

1986-91 Engines



Start the engine. Allow it to idle until it reaches normal operating temperature and then run the engine up to full throttle and back again. Observe the gauge and replace the sender if unsatisfactory. If the reading is still unsatisfactory after doing the sender, check the gauge.

1992-98 Engines



■ This test should be performed only after confirming that the oil pressure gauge is operating properly.

The oil pressure sending unit is located on the either side of the engine block, depending on your engine.

Connect a multi-meter as per the manufacturer's instructions. Connect the positive lead of the meter to the sender terminal and the negative lead to the hex nut on the back of the sender housing. With the engine not running, the meter should register continuity as shown in the accompanying chart.

Start the engine and check the sender at the following oil pressure readings:

- 0 psi—227-257 ohms
- 40 psi—92-114 ohms
- 80 psi—21.5-49.5 ohms

If any readings vary, replace the unit.

Water Temperature Sender

TESTING



The water temperature sending unit is usually located in the thermostat housing.

1. Disconnect the electrical lead and remove the switch from the thermostat housing.
2. Connect a multi-meter to the switch with the positive lead on the terminal and the negative lead on the hex. Carefully immerse it in a container of oil. Heat the oil very carefully, drop in a cooking thermometer and observe that the readings are as follows:
 - 100°F (38°C): 403-493 ohms
 - 160°F (71°C): 118-138 ohms
 - 220°F (105°C): 44-49 ohms
3. Turn the heat off and allow the water to cool, checking the readings again as it cools.

Audio Warning System

TESTING

■ Not all vessels will be equipped with this system which will sound an alarm when the oil pressure or water temperature reach a specified level. Under normal engine operating conditions, the horn will sound when the ignition switch is turned to the ON position, and continue sounding until the engine is started and oil pressure reaches at least 2-6 psi. The system will also when it senses water temperature above 200°F (93°C).

Oil Pressure Switch



As mentioned previously, the audible warning oil pressure switch is calibrated to "make" or "break" contact at 4 +/-2 psi.

1. Connect a multi-meter as per the manufacturer's instructions. Connect the positive lead to the switch terminal and the negative lead to a good ground. The meter should indicate full continuity (0 ohms).
2. Start the engine and run it at idle. The meter should indicate no continuity (infinity).
3. Replace the switch if either reading is incorrect.

Water Temperature Switch



The audible warning switch is calibrated to "make" or "break" contact when temperature exceeds 195-205°F (88-98°C).

1. Connect a multi-meter as per the manufacturer's instructions. Connect the positive lead to the switch terminal and the negative lead to a good ground.
2. Carefully lower the switch into a container of oil with a cooking thermometer. Carefully heat the container (no flames please) until the thermometer reads above 200°F (93°C).
3. When the oil is below the above temperature, the meter should read no continuity (infinity). At, or above, the designated temperature, the meter should now show full continuity (0 ohms).

Warning Horn



1. Turn the ignition switch to the ON position but do not start the engine. The buzzer should sound and then turn off.
2. If the buzzer does not sound, disconnect the electrical lead at the water temperature sender and touch it briefly to engine ground. If the buzzer sounds, you have a problem in the wiring circuit; if it does not sound, replace it.
3. Disconnect the electrical lead at the oil pressure sender and touch it briefly to engine ground. If the buzzer sounds, you have a problem in the wiring circuit; if it does not sound, replace it.

Ignition Switch

TESTING



◆ See Figure 148

■ Before performing this test, please ensure that all fuses and the starter motor are in good condition.

- 1 Disconnect the battery cables and connect a multi-meter as per the manufacturer's instructions
- 2 Tag and disconnect all leads at the back of the switch
- 3 With the ignition switch in the **OFF** position, test for continuity across all of the terminals on the back of the switch—there should be none (the meter should show infinity) Note that on stern drives, terminals **M** and **C** are not used
- 4 Move the ignition switch to the **ON** position Check for continuity between terminals **A** and **B**
- 5 Move the ignition switch to the **START** position There should be continuity between terminals **S** and **B**
- 6 Reconnect all leads and coat them with Liquid Neoprene. Disconnect the meter and connect the battery cables

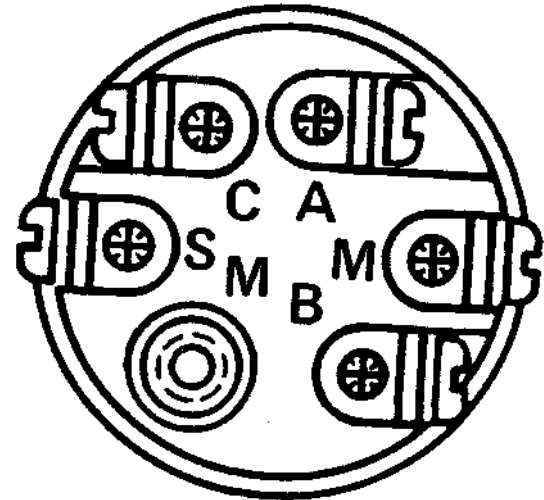


Fig. 148 Rear of a typical ignition switch

WIRING DIAGRAMS

INDEX

WIRE COLOR KEY CHART	10-60
ENGINE	10-61
1986.....	10-61
1987-88.....	10-61
FORD ENGINES	10-62
GM ENGINES	10-61
1989.....	10-62
FORD ENGINES	10-63
GM ENGINES	10-62
1990.....	10-63
3.0L (PWC), 4.3L AND 5.7L GM ENGINES W/COBRA.....	10-63
3.0L (PWS) GM ENGINES W/COBRA.....	10-64
4.3 HO GM ENGINES W/COBRA.....	10-64
5.7LE GM ENGINES.....	10-65
FORD ENGINES W/COBRA.....	10-65
FORD ENGINES W/KING COBRA.....	10-66
GM ENGINES W/KING COBRA.....	10-66
1991.....	10-67
3.0L GM ENGINES.....	10-67
4.3L AND 5.7L GM ENGINES W/COBRA.....	10-67
4.3 HO GM ENGINES W/COBRA.....	10-68
5.7LE GM ENGINES W/COBRA.....	10-68
5.0L AND 5.8L FORD ENGINES.....	10-69
350 AND 454 GM ENGINES W/KING COBRA.....	10-69
1992-93.....	10-70
3.0L GM ENGINES.....	10-70
4.3L GM ENGINES.....	10-70
5.7L GM ENGINES W/COBRA.....	10-71
5.7LE GM ENGINES W/COBRA.....	10-71
5.0L AND 5.8L FORD ENGINES W/COBRA (1992).....	10-72
5.0L AND 5.8L FORD (CARB) ENGINES W/COBRA (1993).....	10-73
5.0L AND 5.8L FORD (EFI) ENGINES W/COBRA (1993).....	10-73

351 FORD ENGINES W/KING COBRA (1992).....	10-72
351 FORD ENGINES W/KING COBRA (1993).....	10-74
454 AND 502 GM ENGINES W/KING COBRA.....	10-74
1994.....	10-75
3.0GL/GS GM ENGINES.....	10-75
4.3L GM ENGINES.....	10-75
5.7L GM ENGINES.....	10-76
5.0FL AND 5.8FL FORD ENGINES.....	10-76
5.0Fi AND 5.8Fi FORD ENGINES.....	10-77
351 EFI FORD ENGINES W/KING COBRA.....	10-77
7.4GL GM ENGINES W/KING COBRA.....	10-78
1995-96.....	10-78
3.0GS GM ENGINES.....	10-78
4.3GL/GS GM ENGINES.....	10-79
4.3Gi AND 5.7Gi GM ENGINES.....	10-81
5.0FL AND 5.8FL FORD ENGINES.....	10-79
5.0Fi AND 5.8Fi FORD ENGINES.....	10-80
7.4GL GM ENGINES W/KING COBRA.....	10-80
7.4 EFI GM ENGINES W/KING COBRA (1995).....	10-81
7.4Gi GM ENGINES W/KING COBRA (1996).....	10-82
1997-98.....	10-82
3.0GS GM ENGINES.....	10-82
4.3GL/GS GM ENGINES.....	10-83
4.3Gi AND 5.7Gi/GSi GM ENGINES.....	10-84
5.7GL/GS GM ENGINES.....	10-83
7.4GL GM ENGINES.....	10-84
7.4Gi GM ENGINES (1997).....	10-85
7.4Gi GM ENGINES (1998).....	10-85
7.4GSi AND 8.2GSi GM ENGINES (1998).....	10-86
MAIN HARNESS	10-86
1986 ENGINES.....	10-86
1987-90 ENGINES.....	10-87
1991 ENGINES.....	10-87
1992-93 ENGINES.....	10-88
1994-98 ENGINES.....	10-88

CODE	WIRE COLOR
B	BLACK
BL	BLUE
BN	BROWN
GN	GREEN
GR	GREY
LBL	LIGHT BLUE
LBN	LIGHT BROWN
LTGN	LIGHT GREEN
OR	ORANGE
P	PINK
PU	PURPLE
R	RED
SB	SOLID BLACK
T	TAN
VO	VIOLET
W	WHITE
Y	YELLOW

NOTE: Main wire color is the first color, while the **stripe/trace** color is the second color on multi-colored wires.

T/B = Tan wire with Black stripe

R/PU = Red wire with Purple stripe

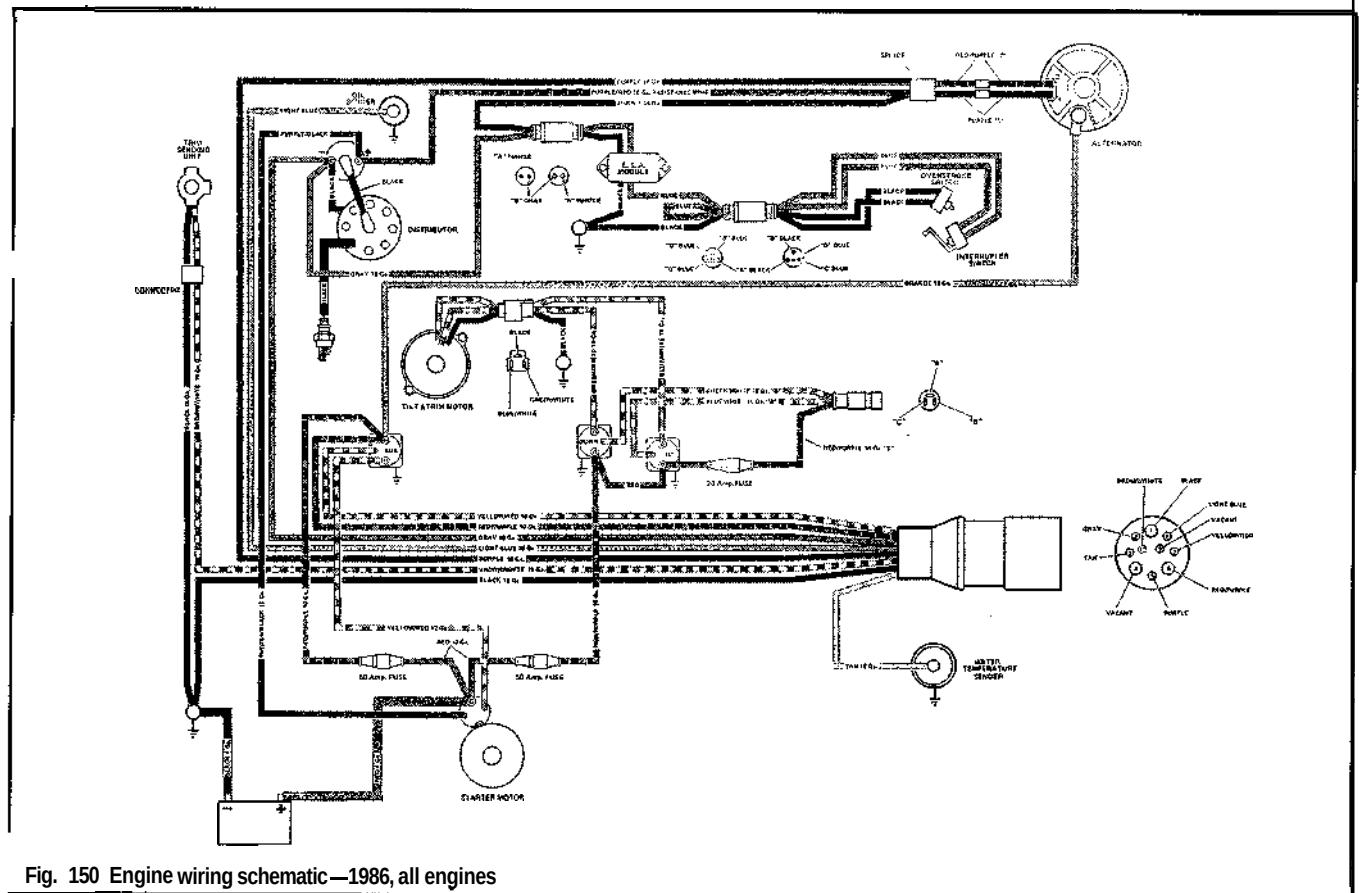


Fig. 150 Engine wiring schematic—1986, all engines

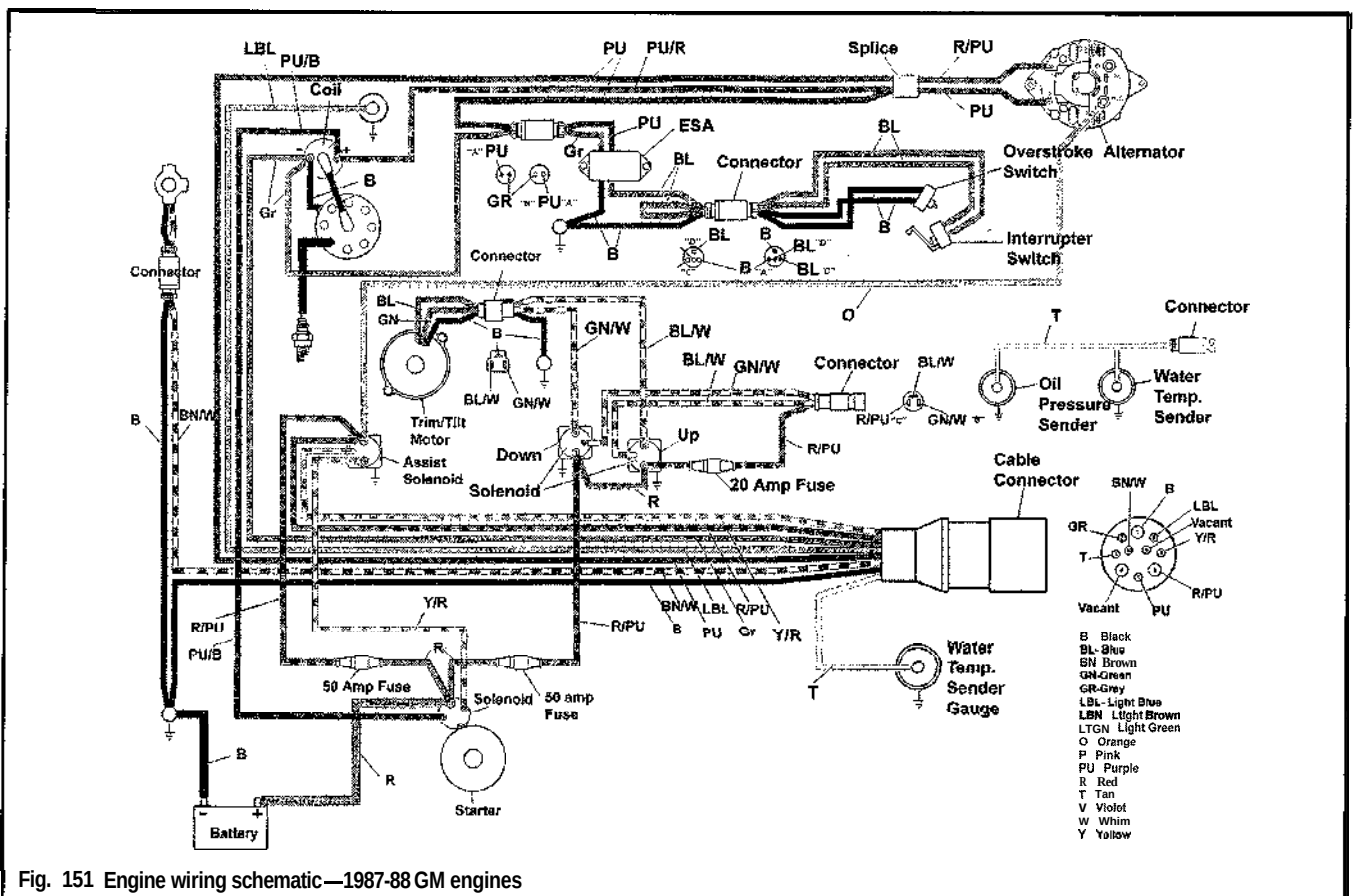


Fig. 151 Engine wiring schematic—1987-88 GM engines

10-62 IGNITION AND ELECTRICAL SYSTEMS

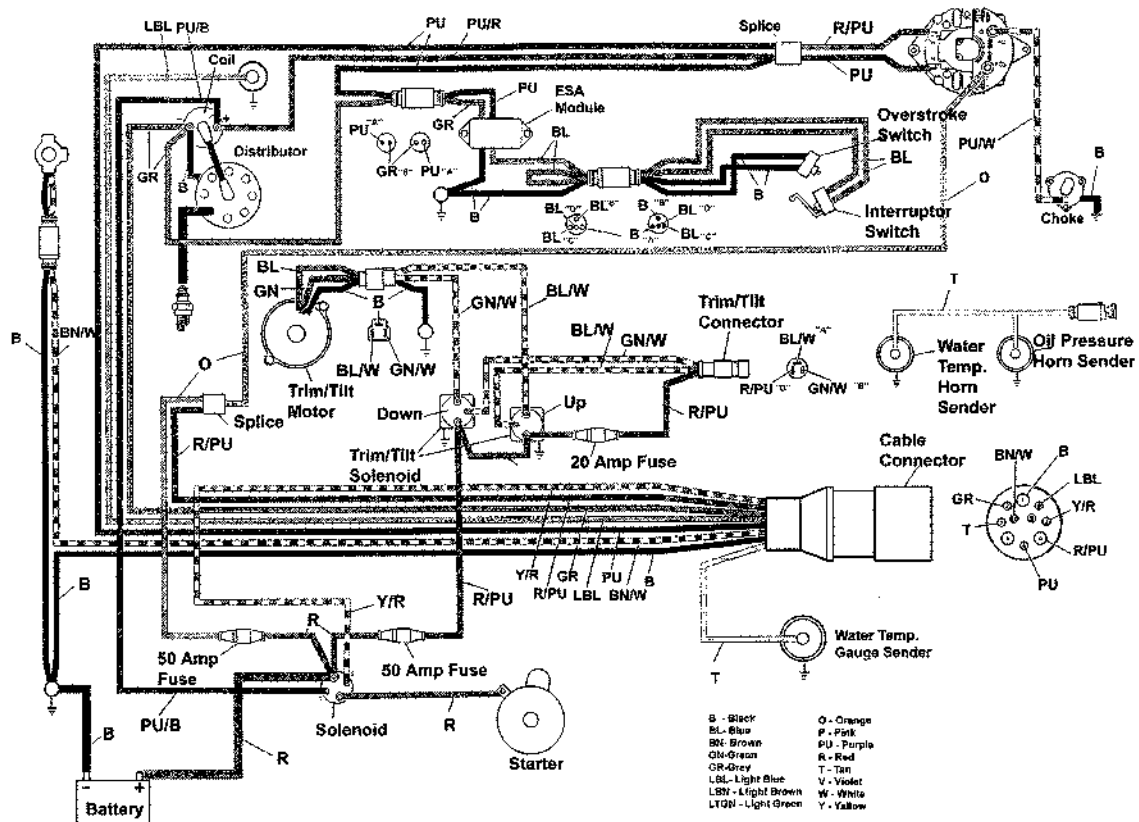


Fig. 52 Engine wiring schematic—1987-88 Ford engines

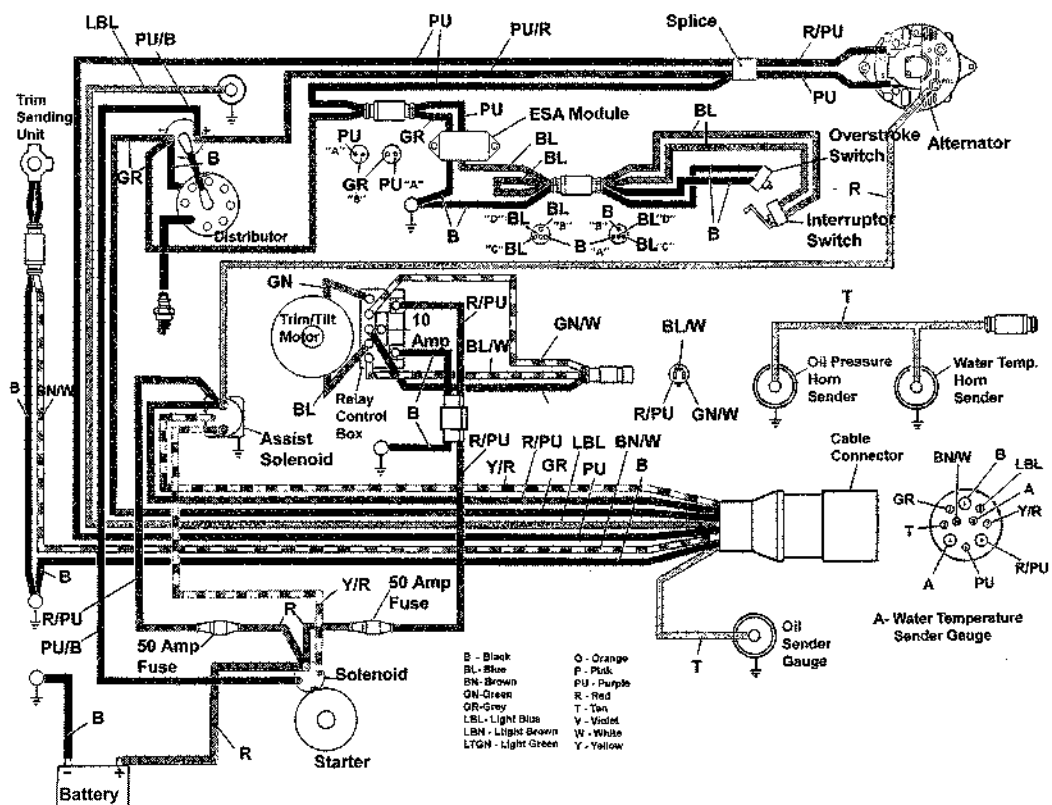


Fig. 153 Engine wiring schematic—1989 GM engines

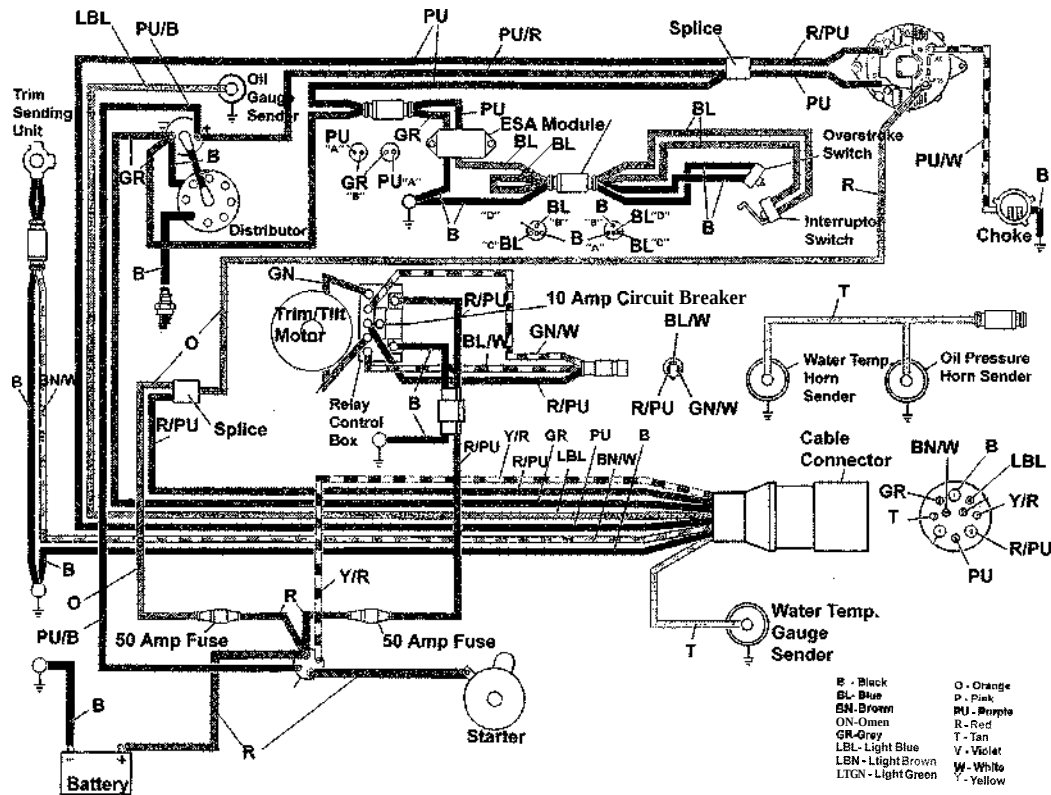


Fig. 154 Engine wiring schematic—1989 Ford engines

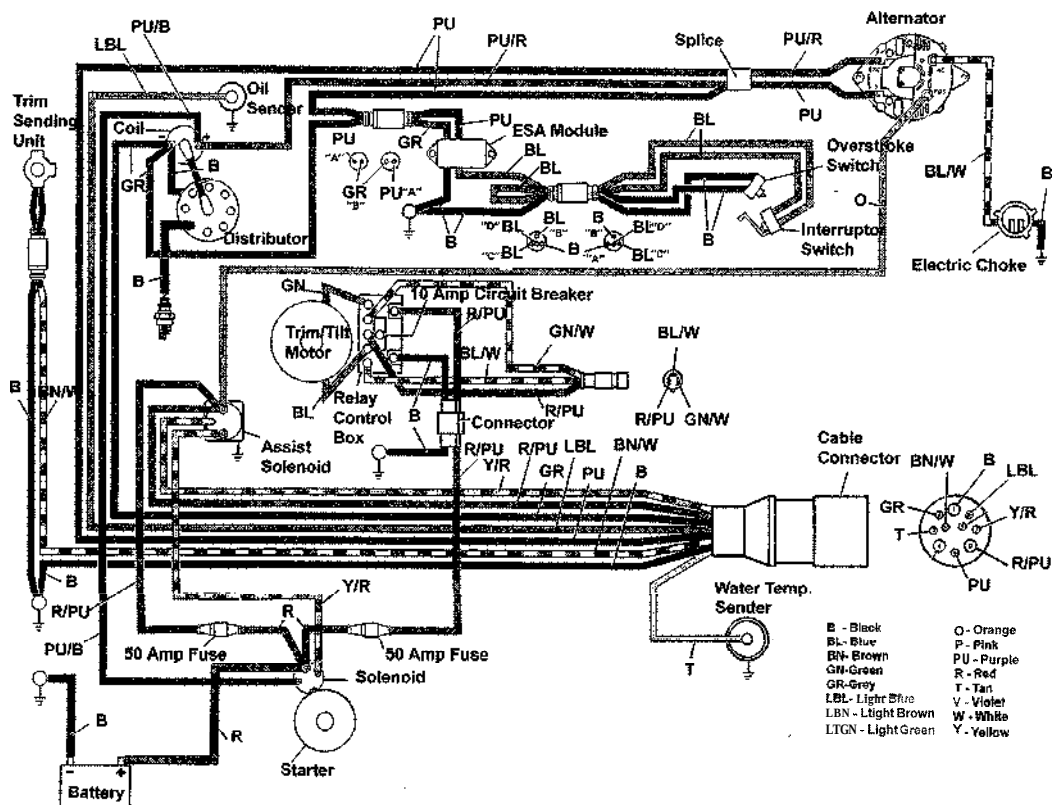


Fig. 155 Engine wiring schematic—1990 3.0L (PWC), 4.3L and 5.7L GM engines w/Cobra

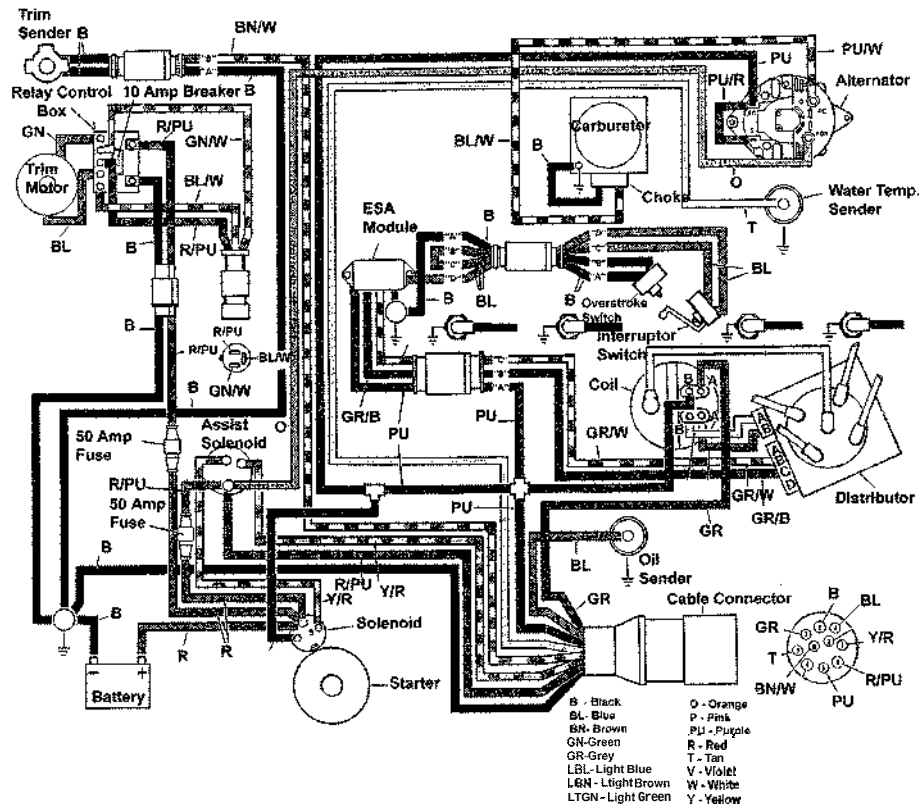


Fig. 156 Engine wiring schematic—1990 3.0L (PWS) GM engines w/Cobra

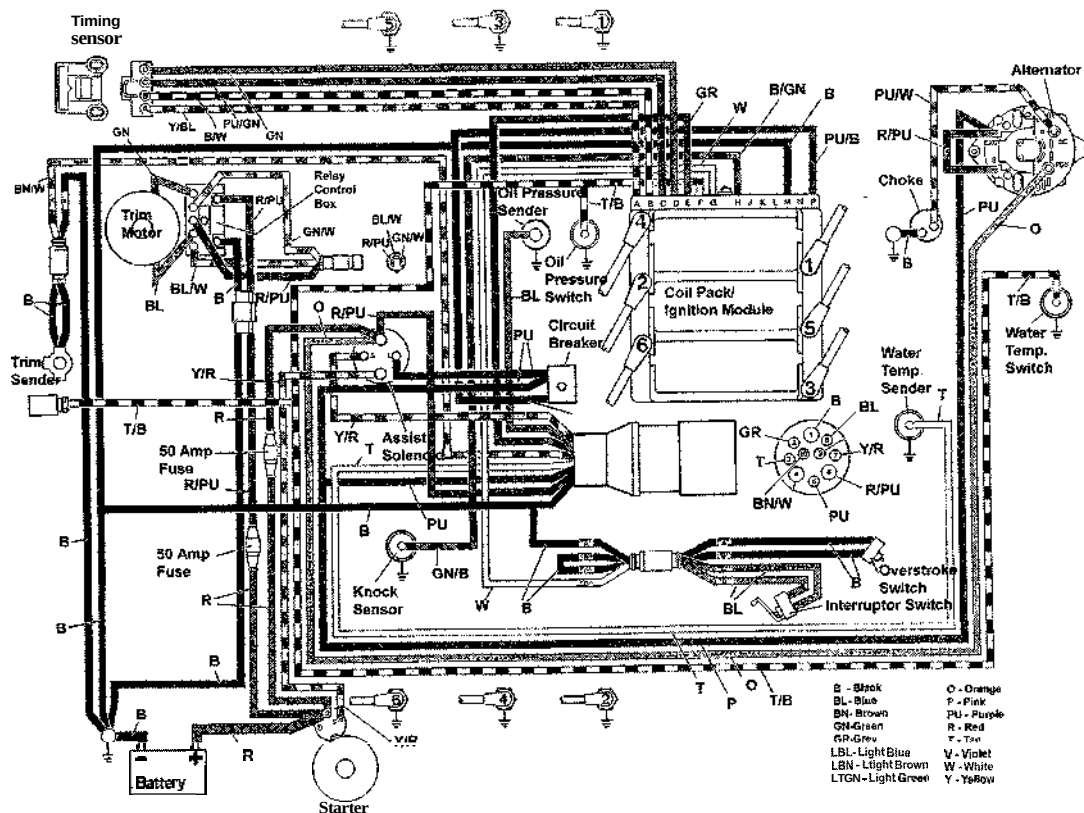


Fig. 157 Engine wiring schematic—1990 4.3 HO GM engines w/Cobra

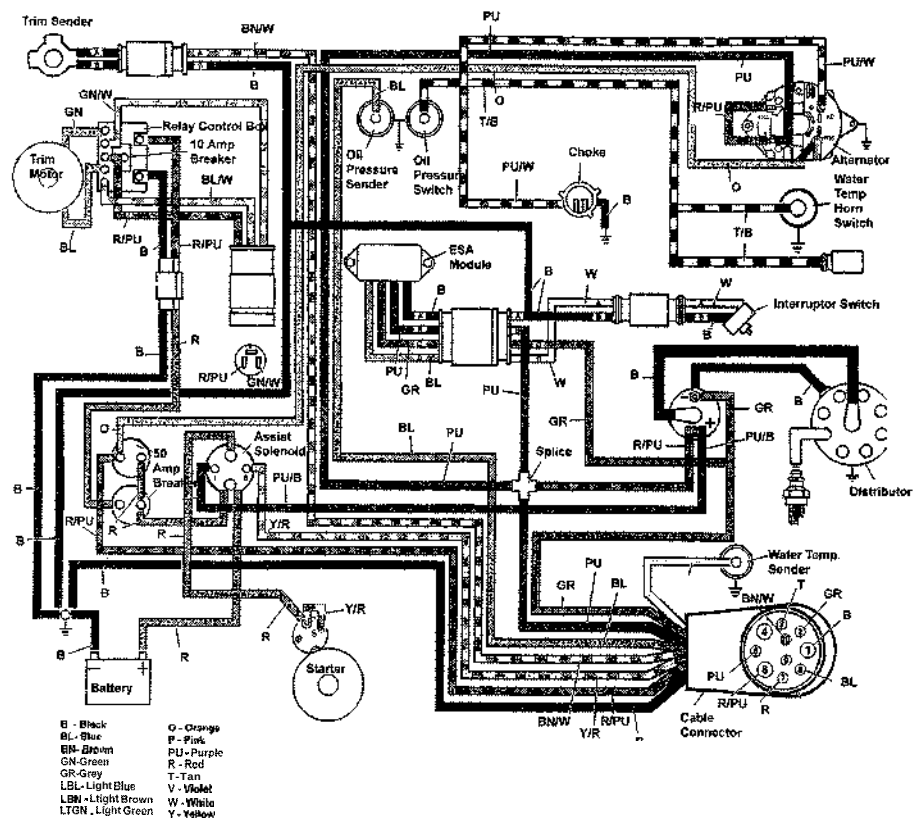


Fig. 158 Engine wiring schematic—1990 5.7LE GM engines

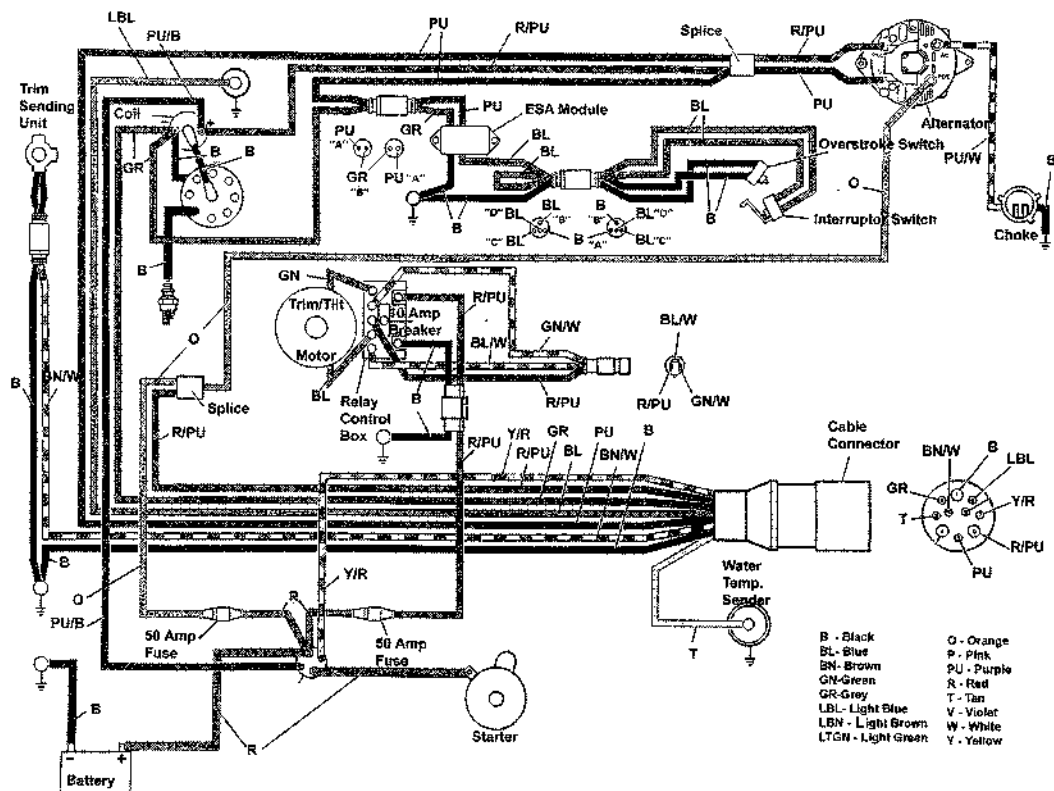


Fig. 159 Engine wiring schematic—1990 Ford engines w/Cobra

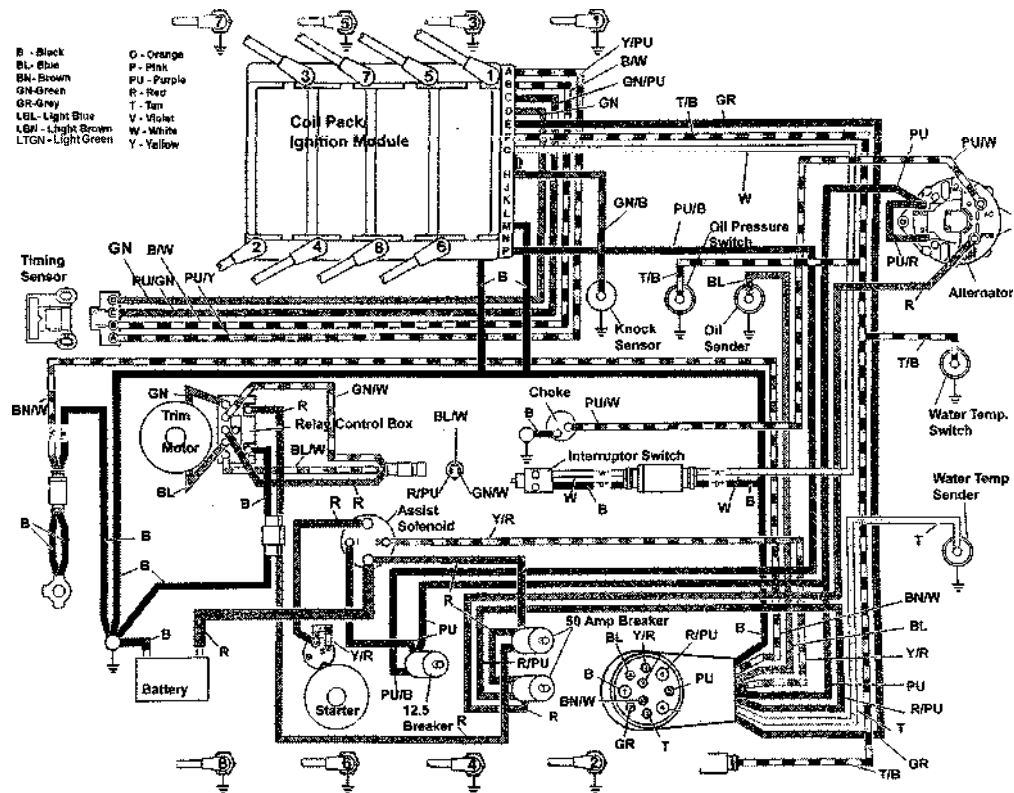


Fig. 160 Engine wiring schematic—1990 GM engines w/King Cobra

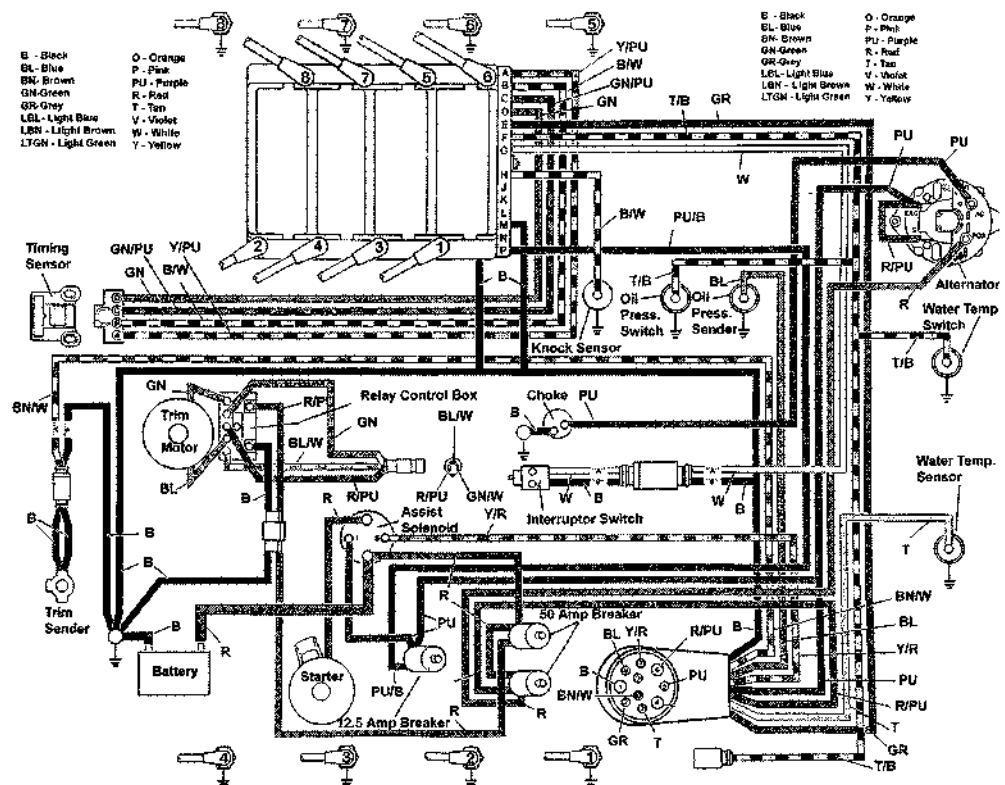
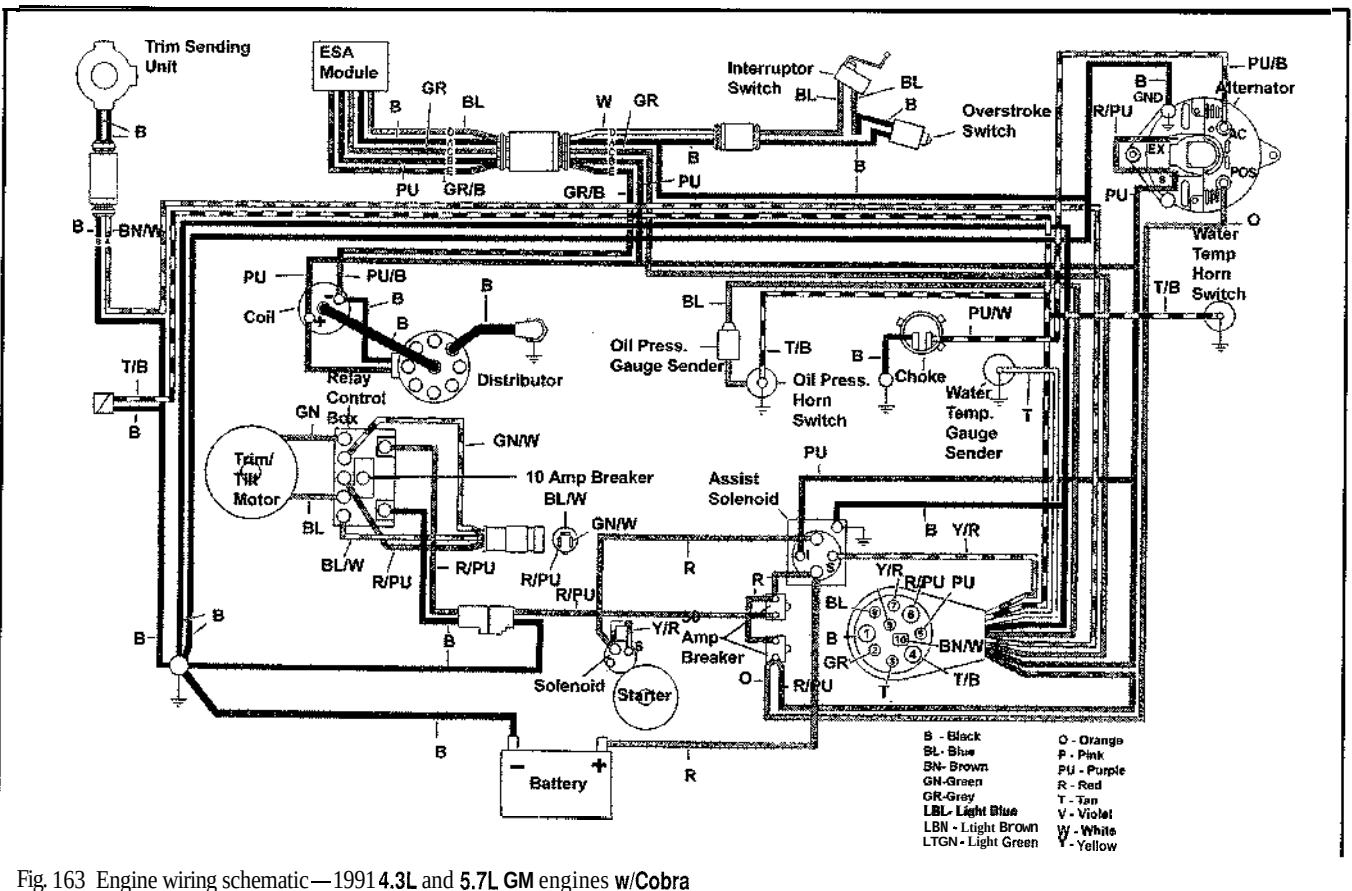
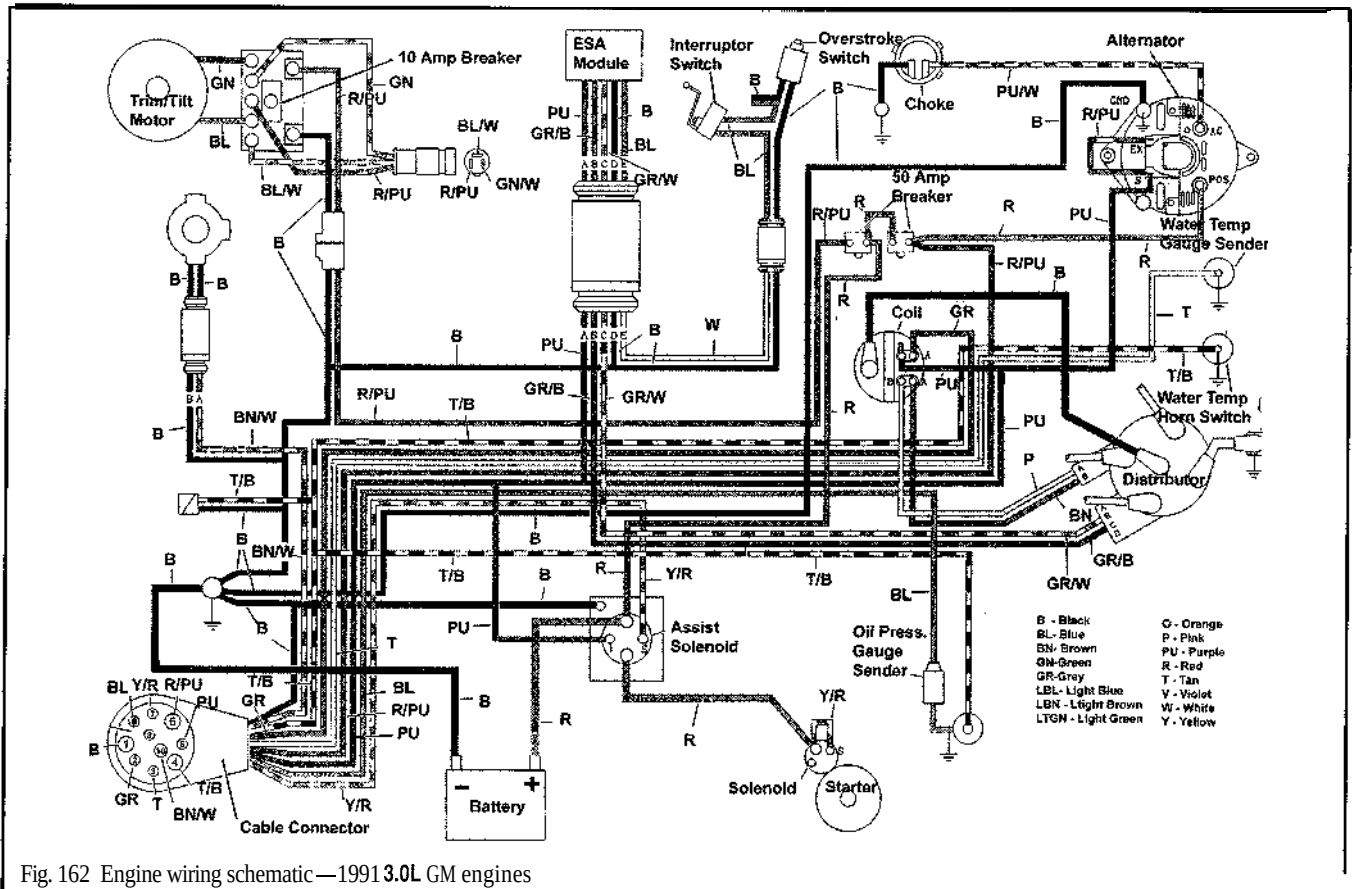


Fig. 161 Engine wiring schematic—1990 Ford engines w/King Cobra



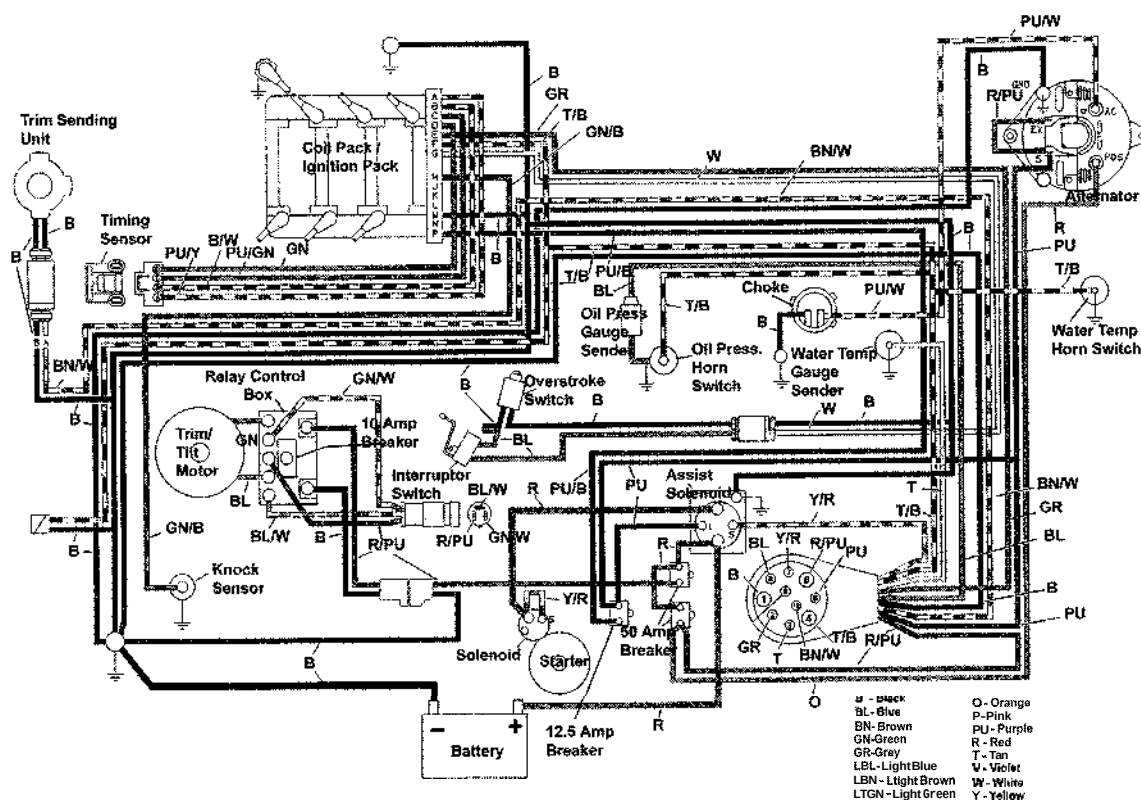


Fig. 164 Engine wiring schematic—1991 4.3 HO GM engines w/Cobra

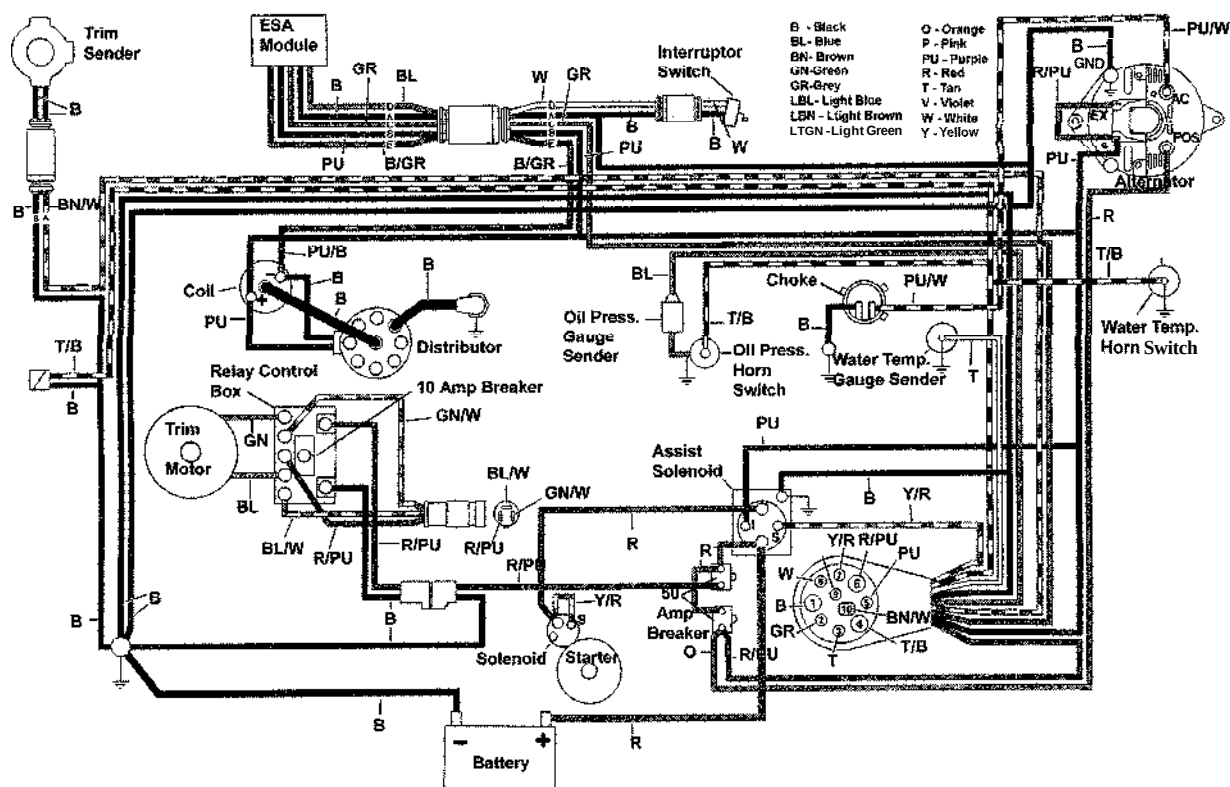
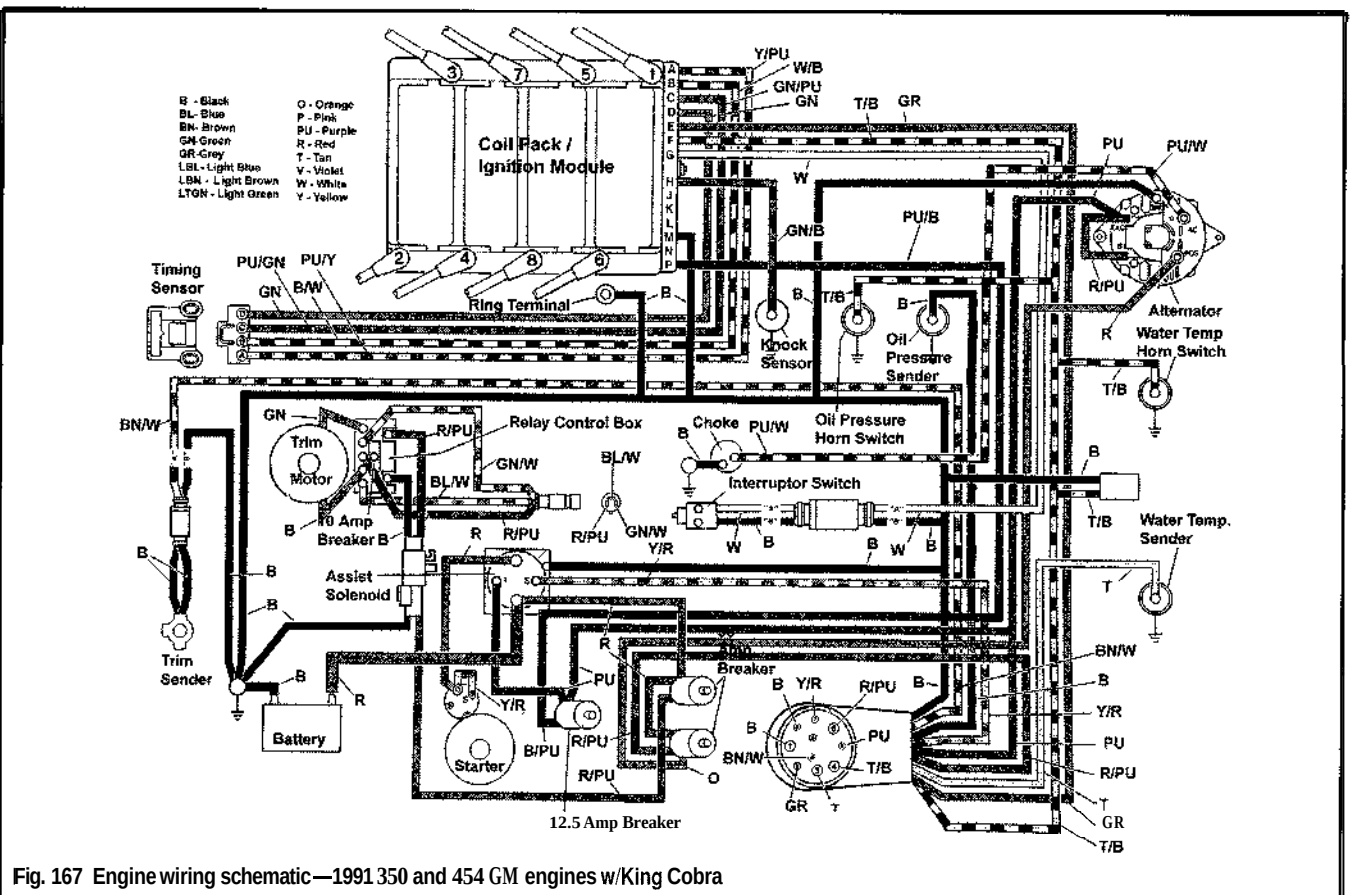
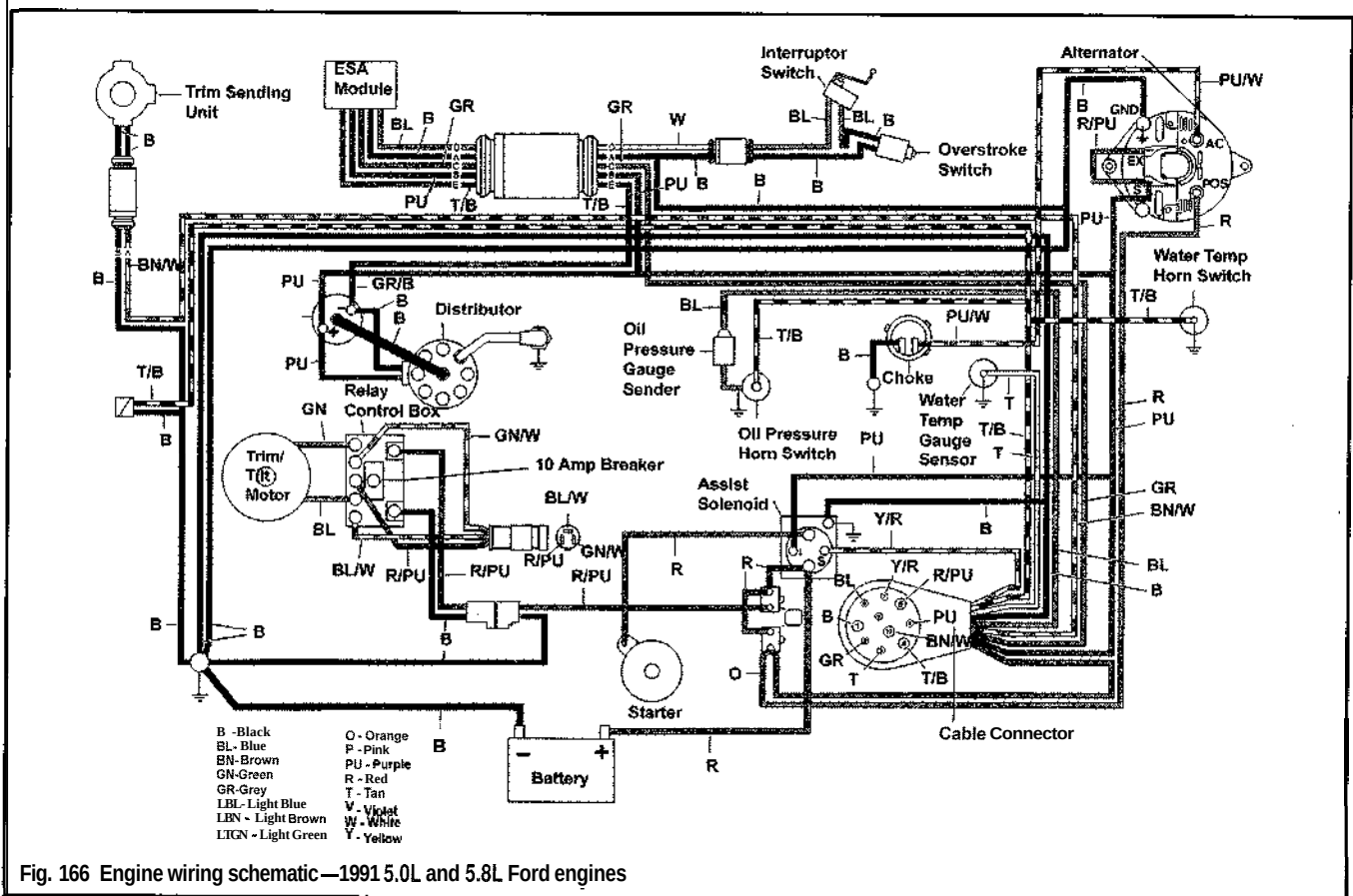
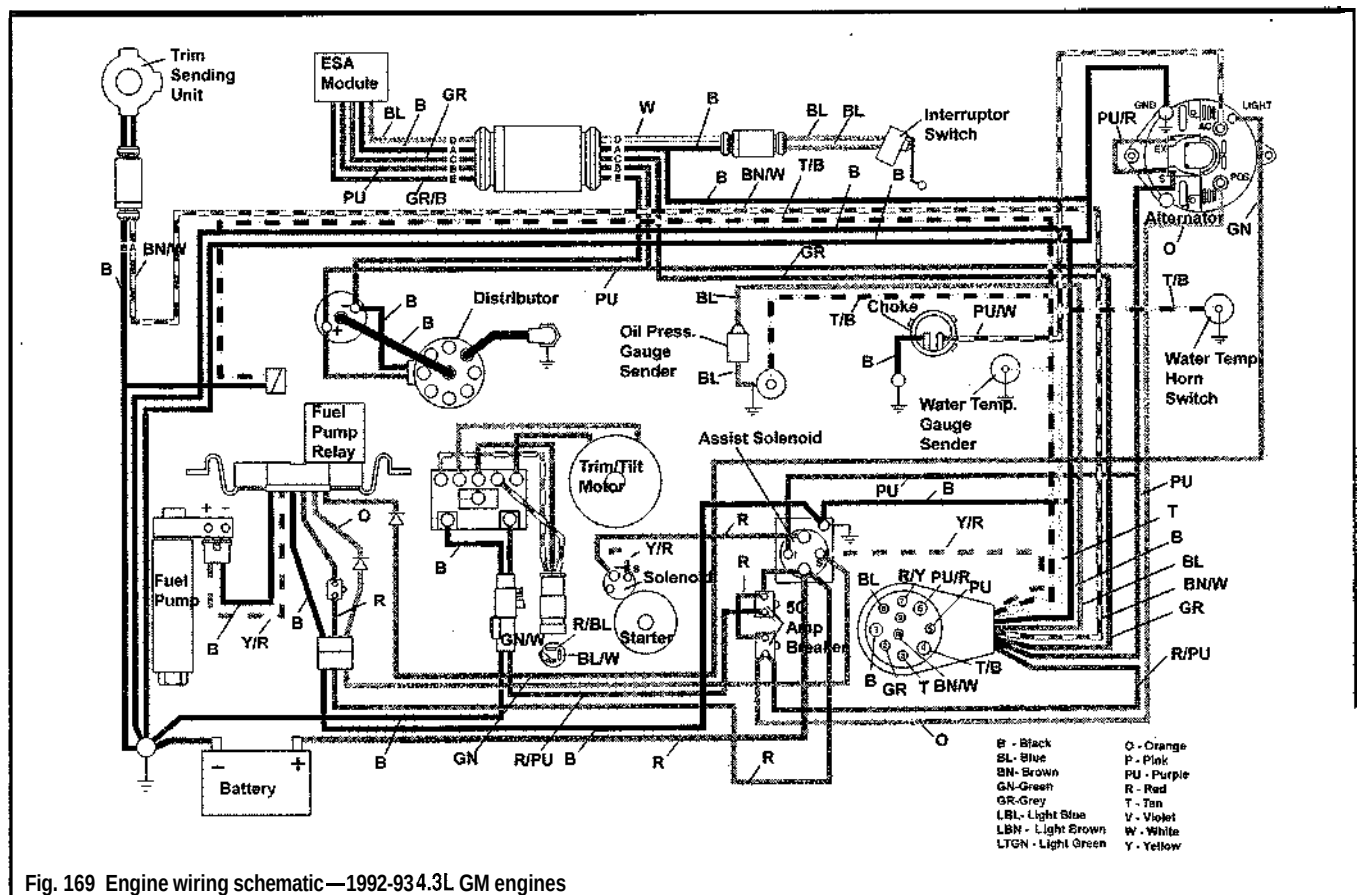
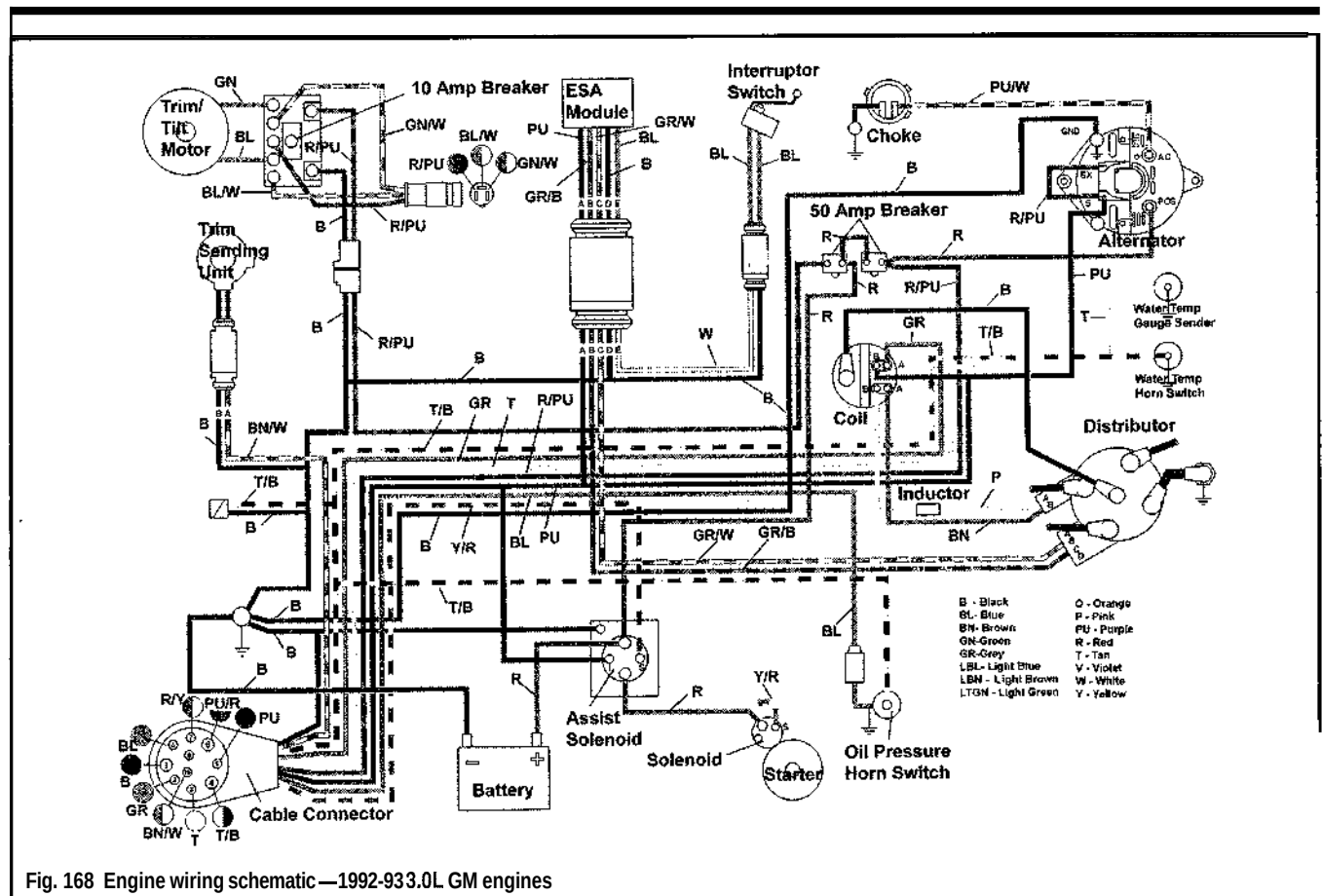


Fig. 165 Engine wiring schematic—1991 5.7LE GM engines w/Cobra



10-70 IGNITION AND ELECTRICAL SYSTEMS



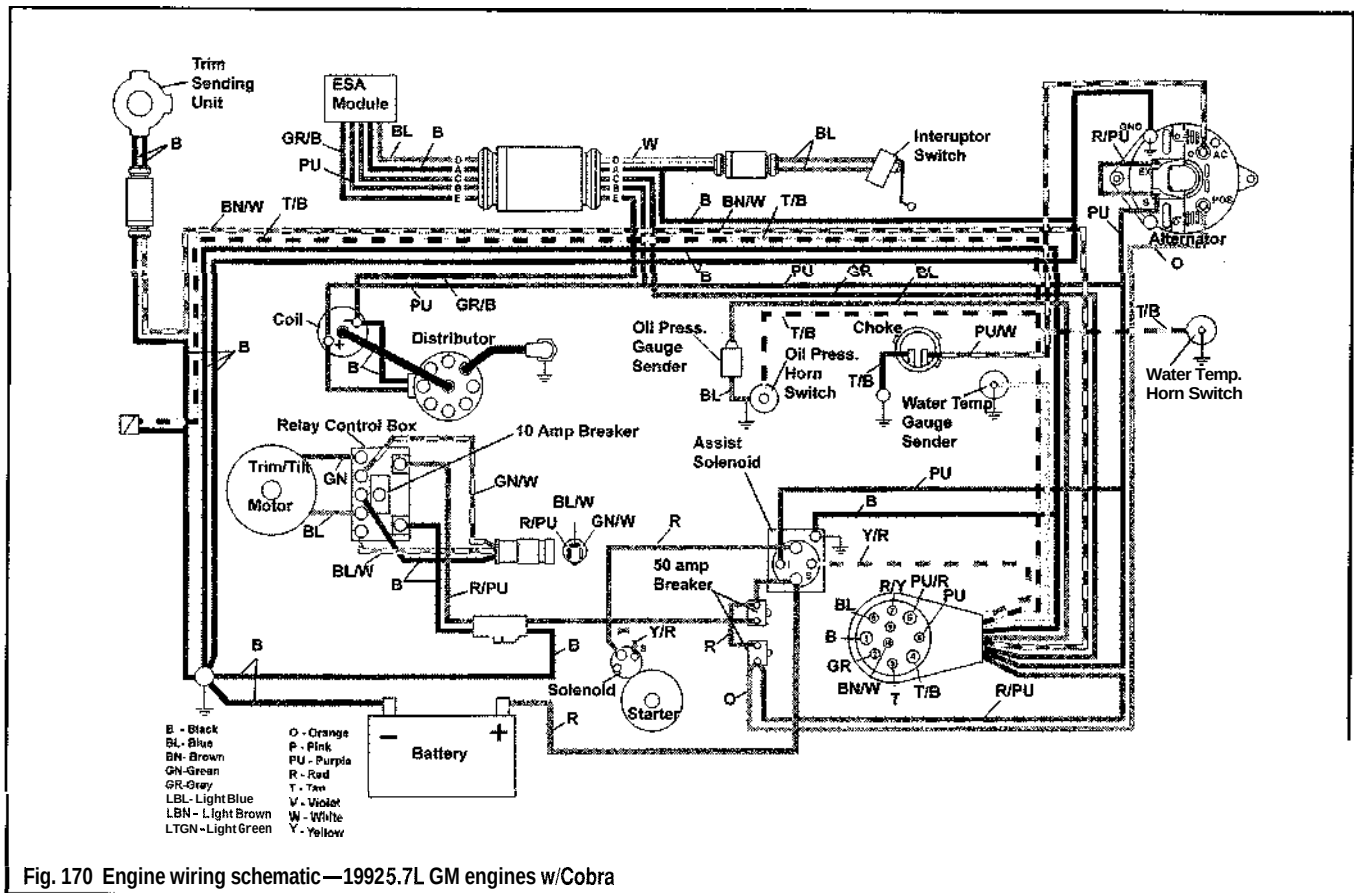


Fig. 170 Engine wiring schematic—1992.7L GM engines w/Cobra

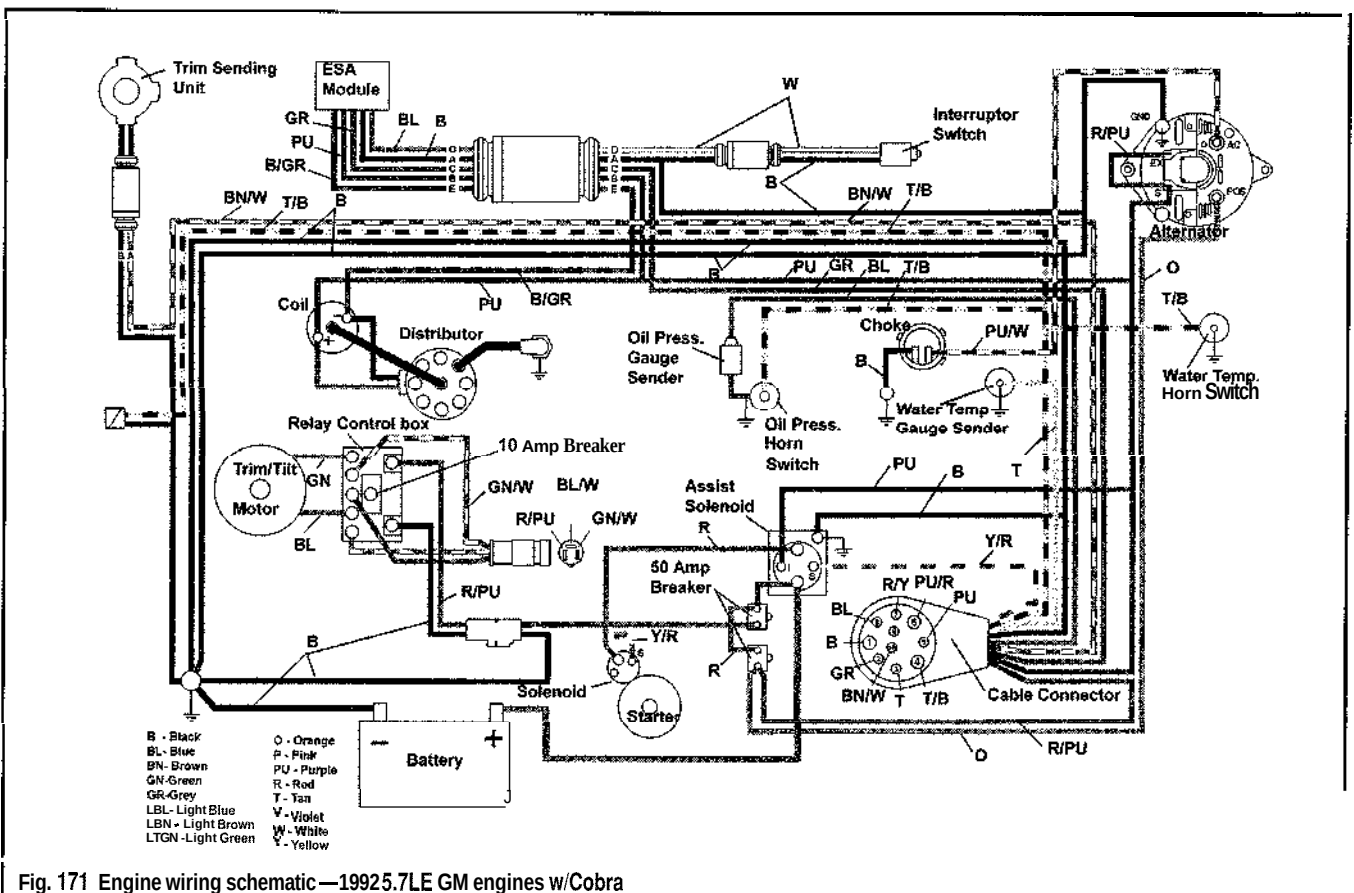


Fig. 171 Engine wiring schematic—1992.7LE GM engines w/Cobra

10-72 IGNITION AND ELECTRICAL SYSTEMS

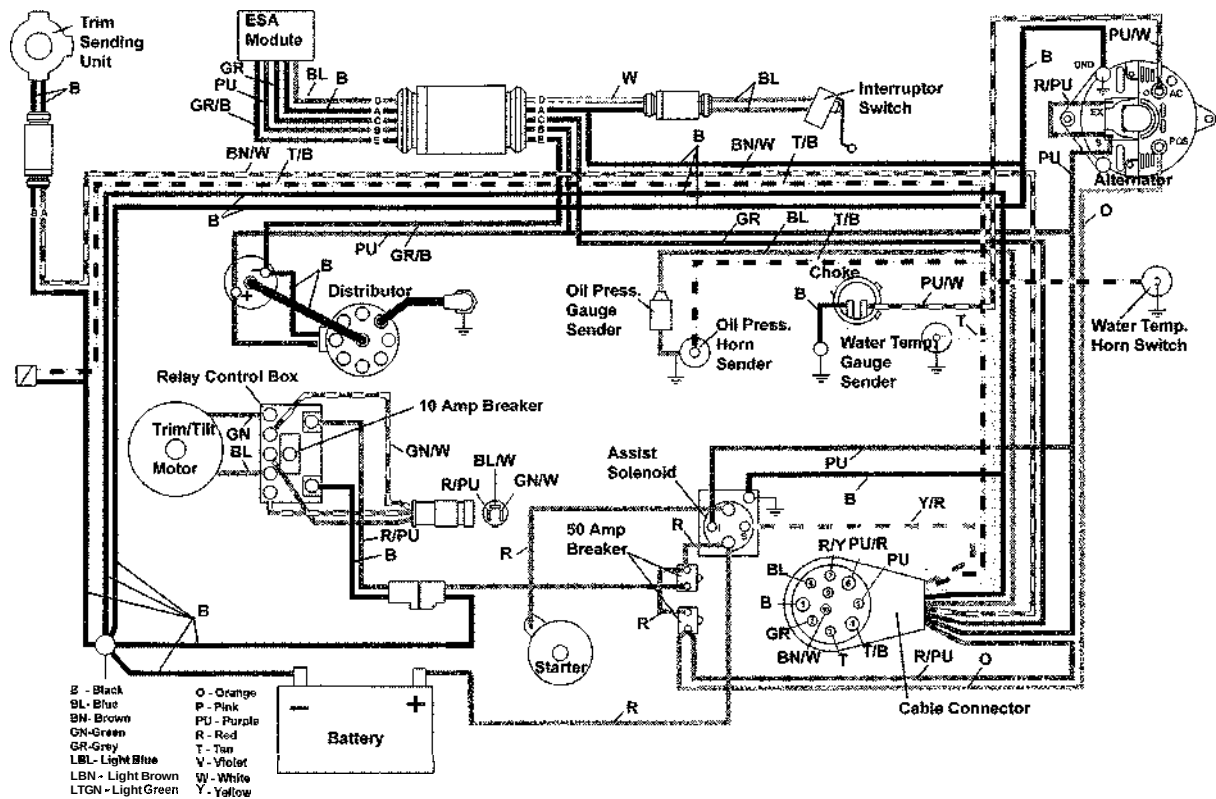


Fig. 172 Engine wiring schematic—1992 5.0L and 5.8L Ford engines w/Cobra

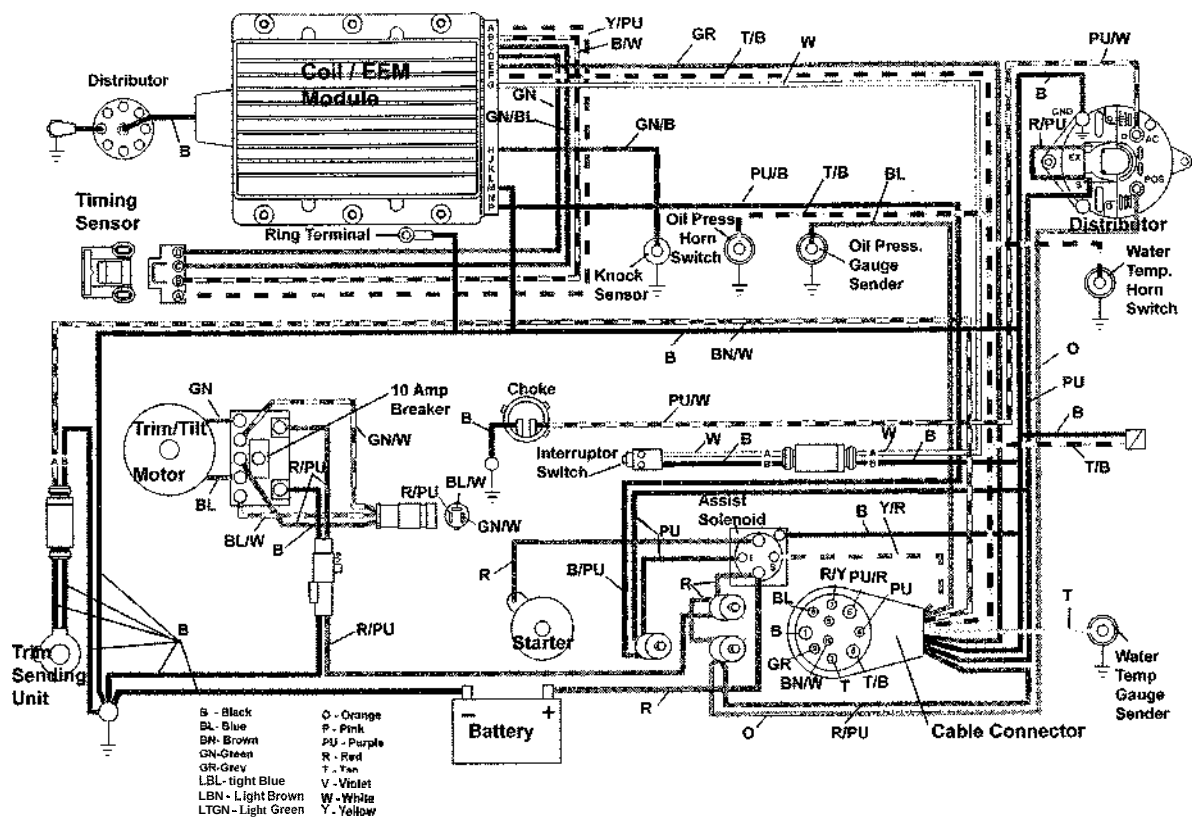
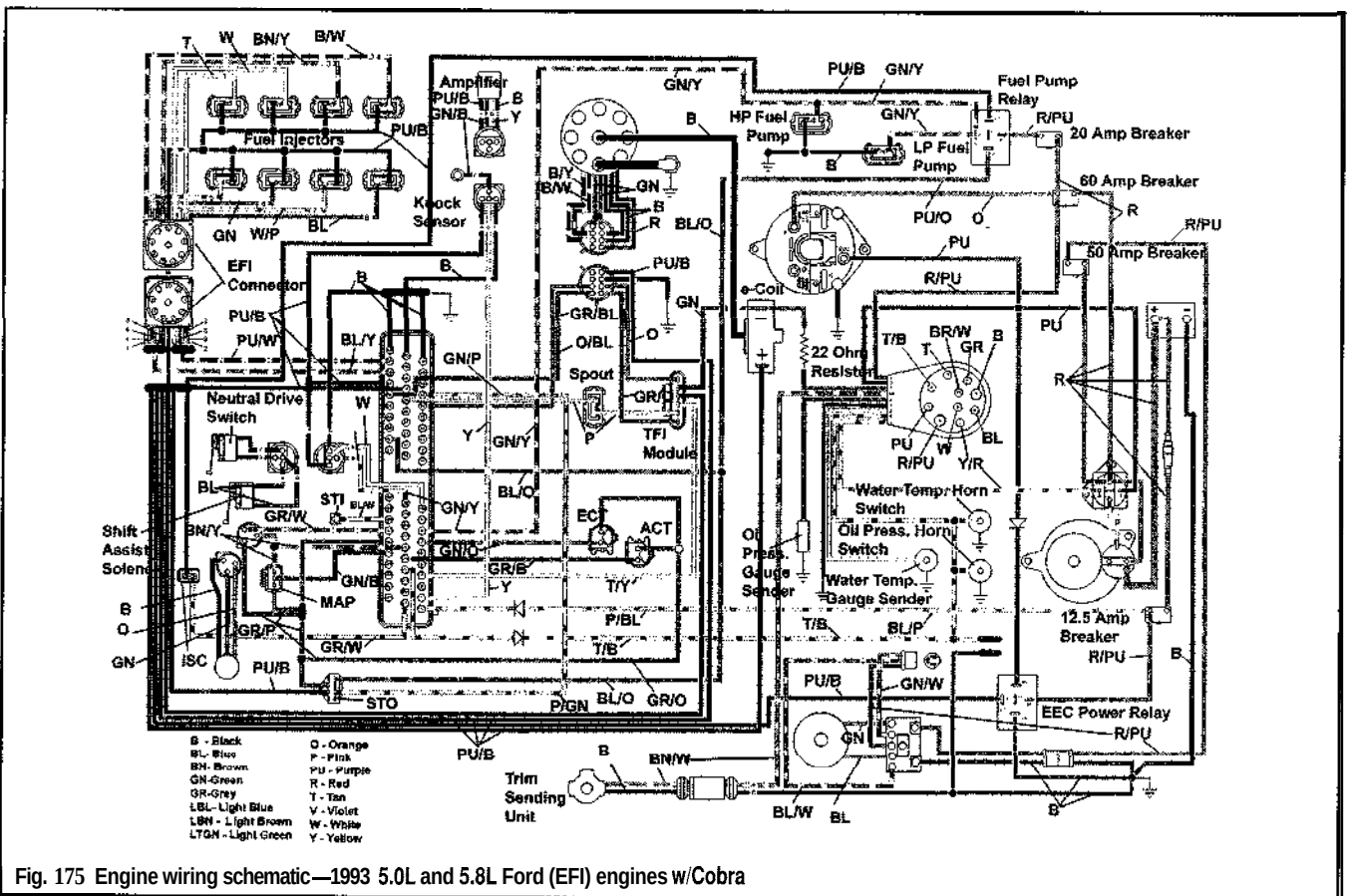
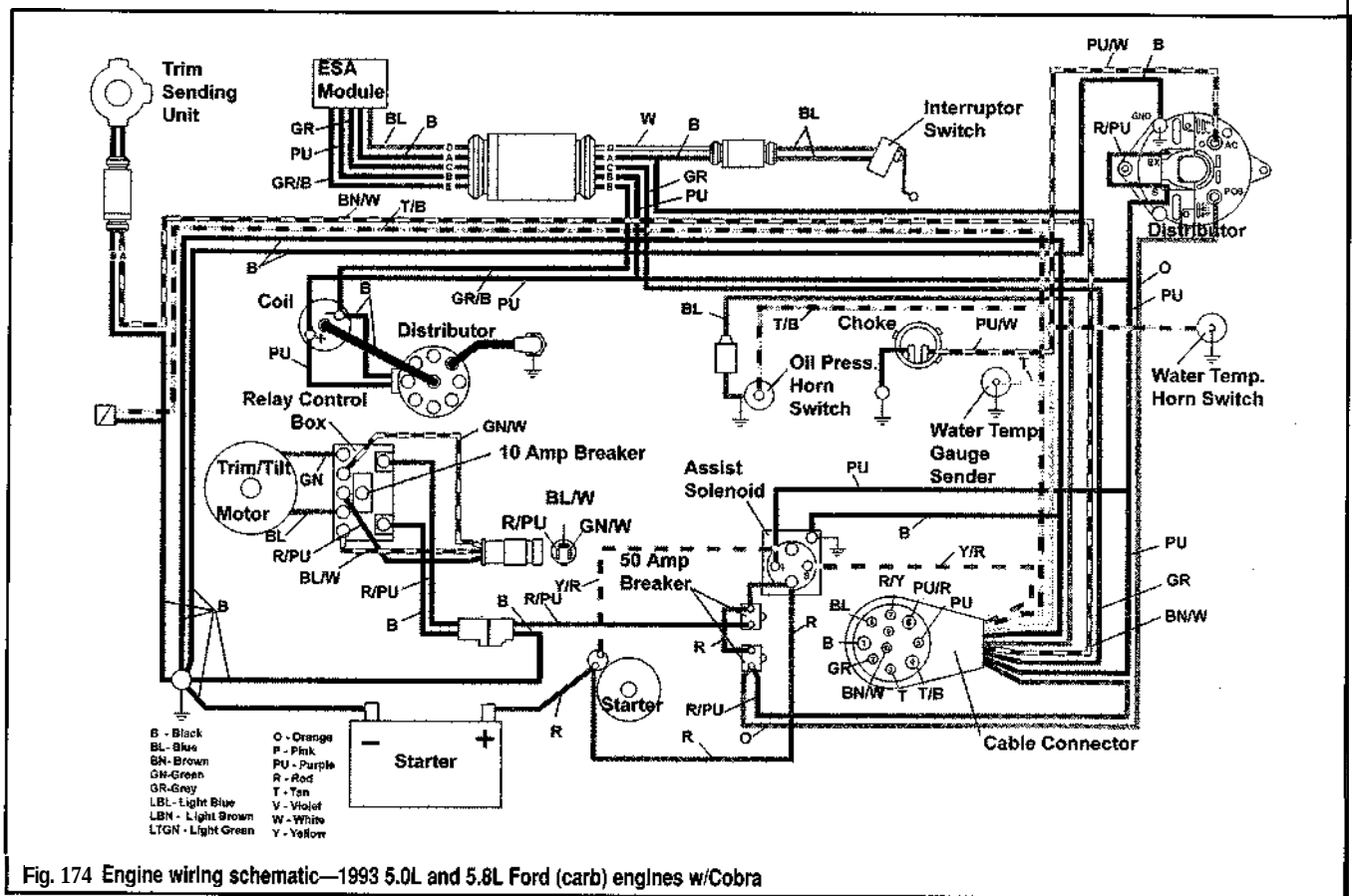


Fig. 173 Engine wiring schematic—1992 351 Ford engines w/King Cobra



10-74 IGNITION AND ELECTRICAL SYSTEMS

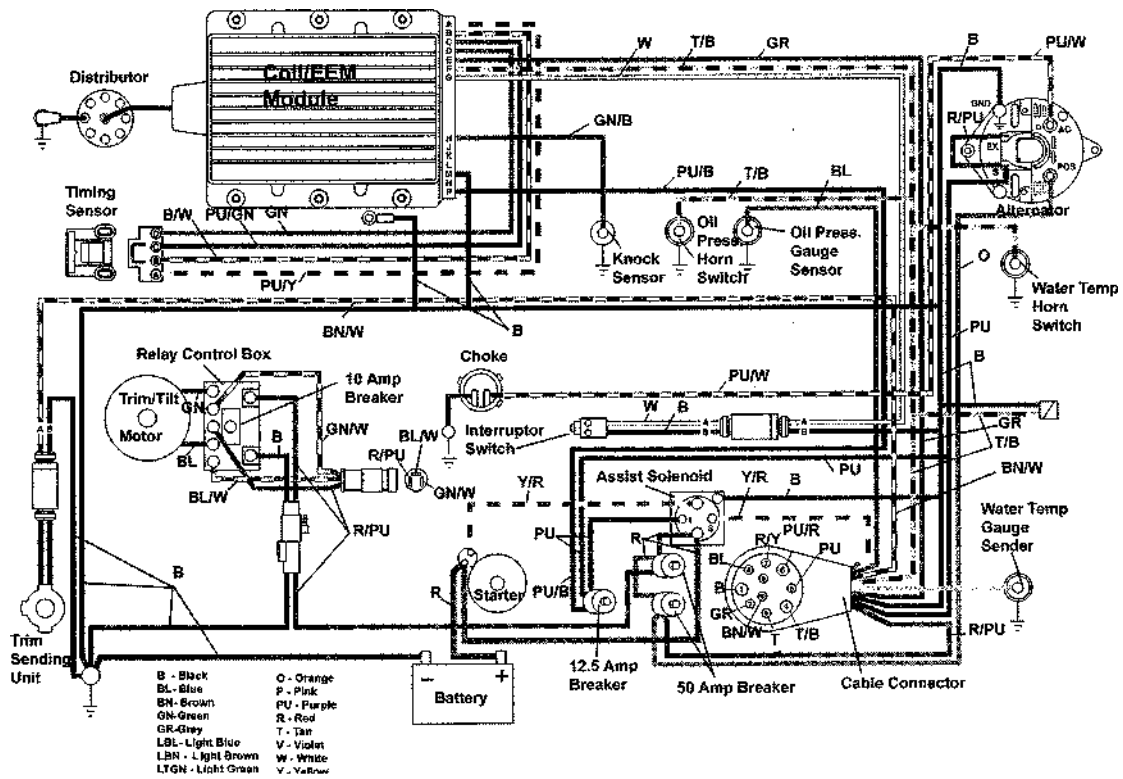


Fig. 176 Engine wiring schematic—1993 351 Ford engines w/King Cobra

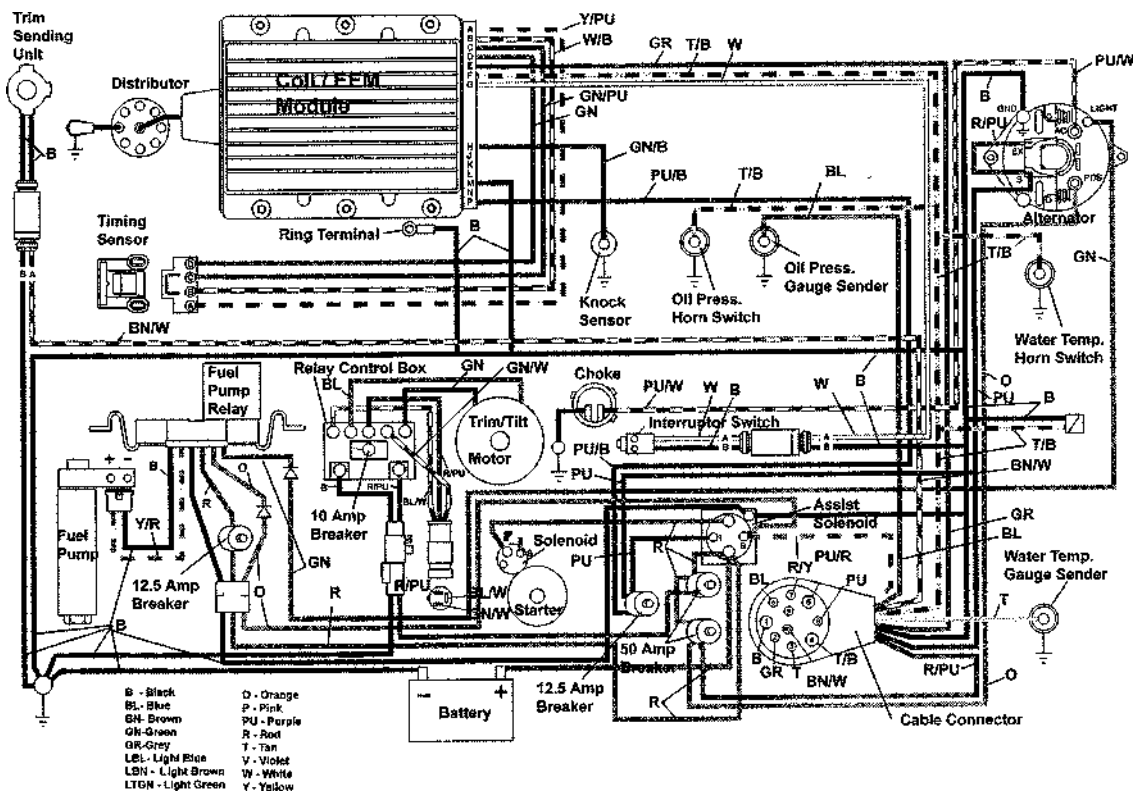
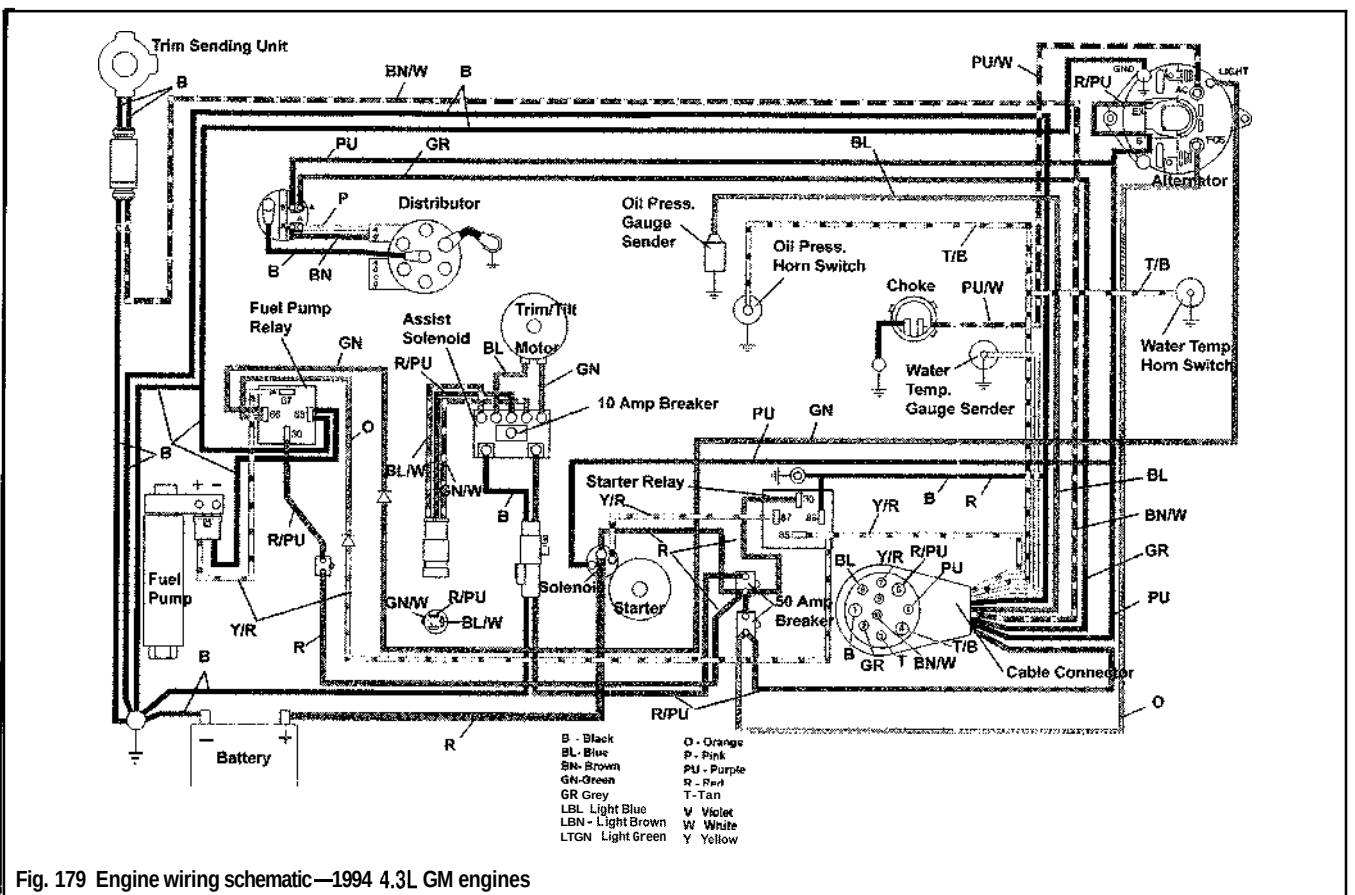
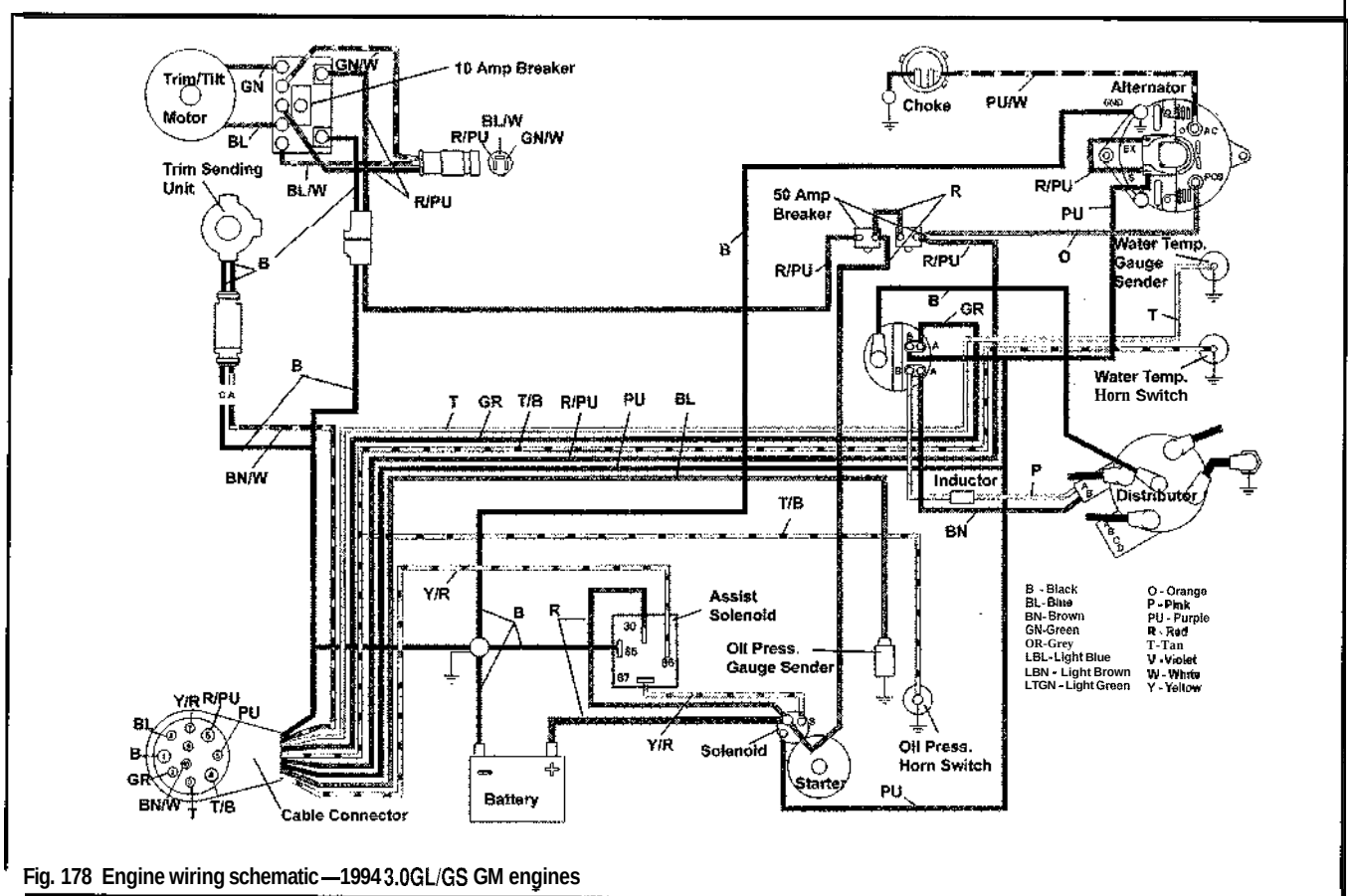


Fig. 177 Engine wiring schematic—1992-93 454 and 502 GM engines w/King Cobra



10-76 IGNITION AND ELECTRICAL SYSTEMS

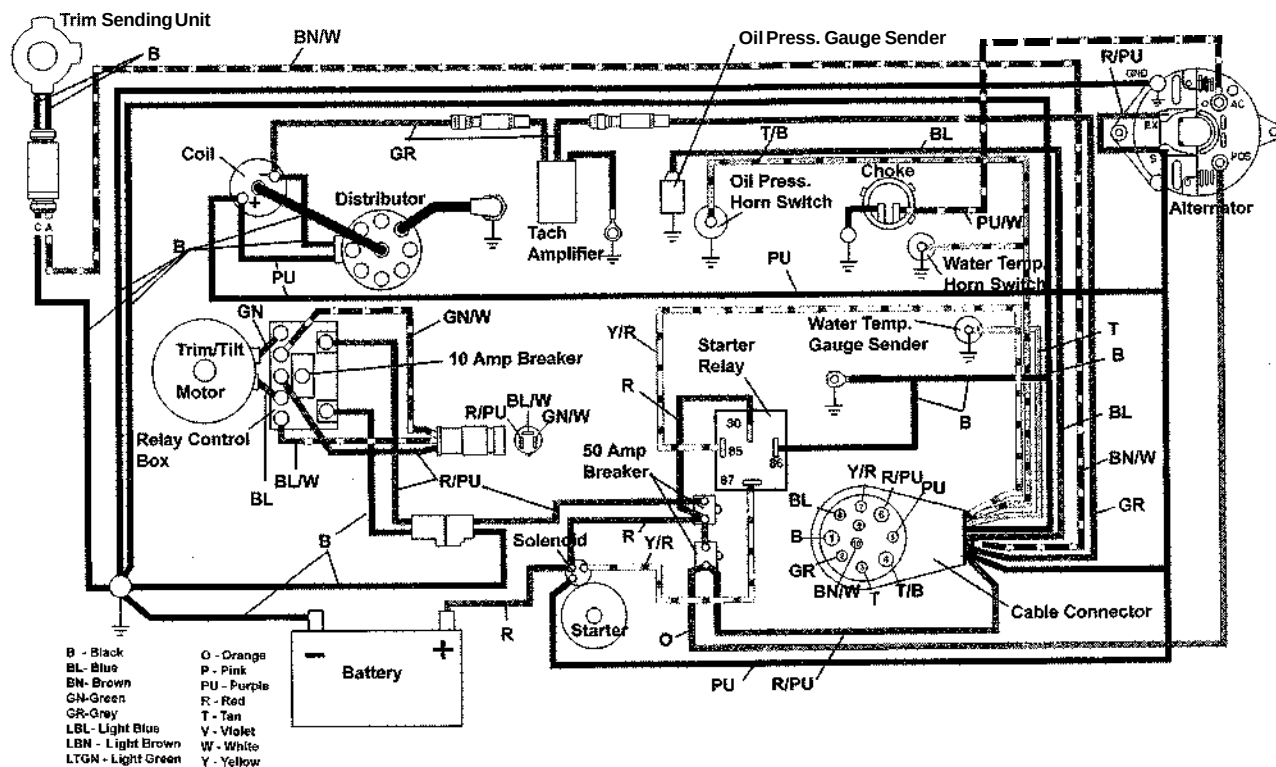


Fig. 180 Engine wiring schematic—1994 5.7L GM engines

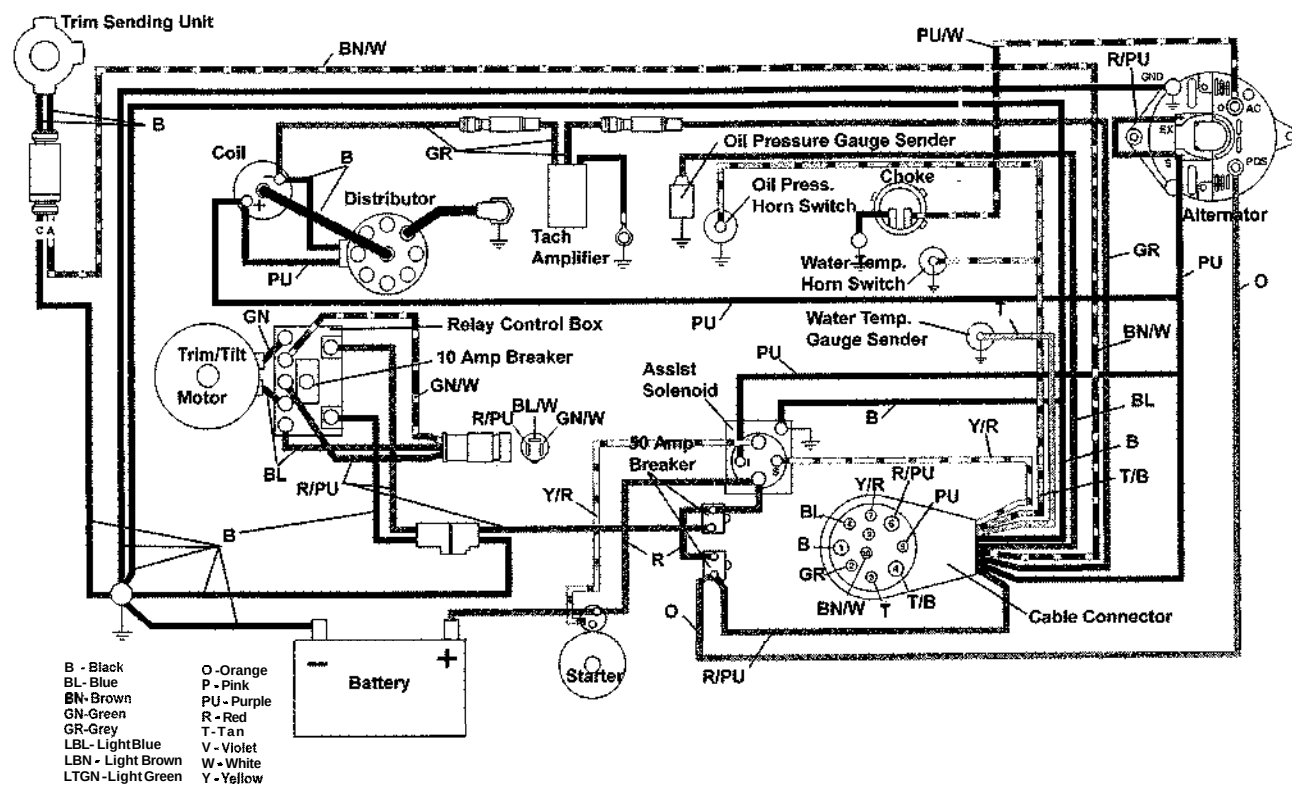


Fig. 181 Engine wiring schematic—1994 5.0FL and 5.8FL Ford engines

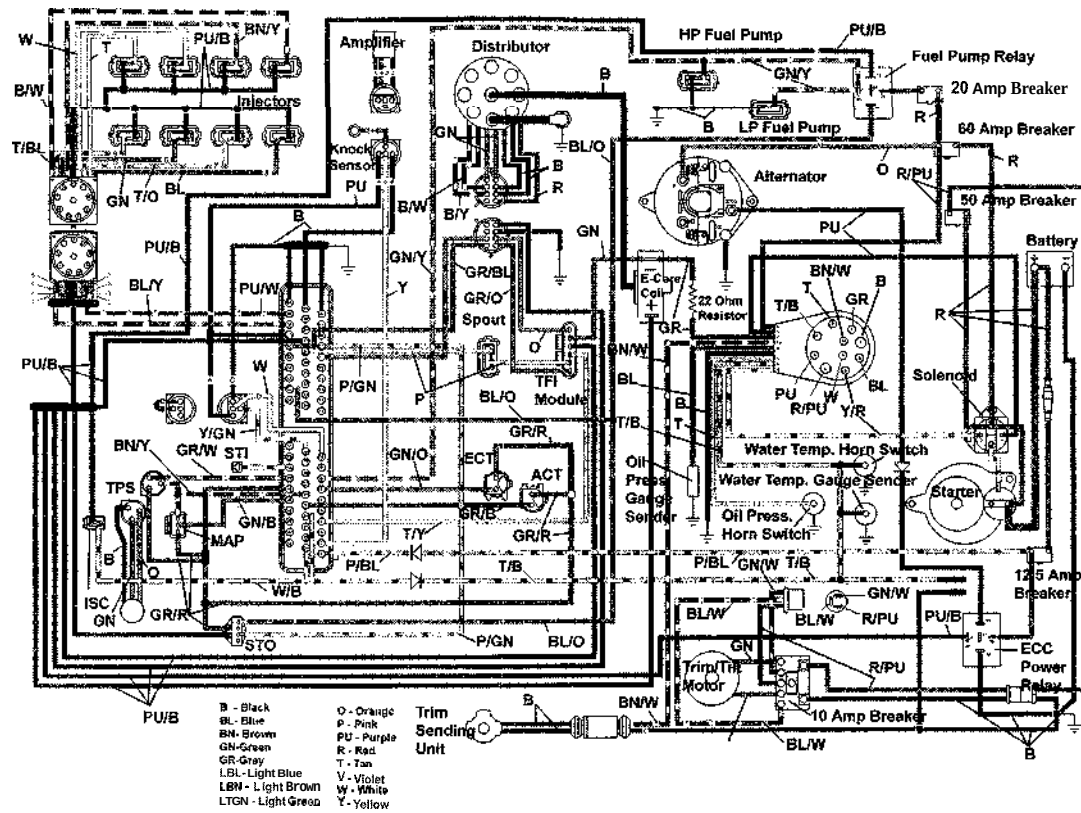


Fig. 182 Engine wiring schematic—1994 5.0Fi and 5.8Fi Ford engines

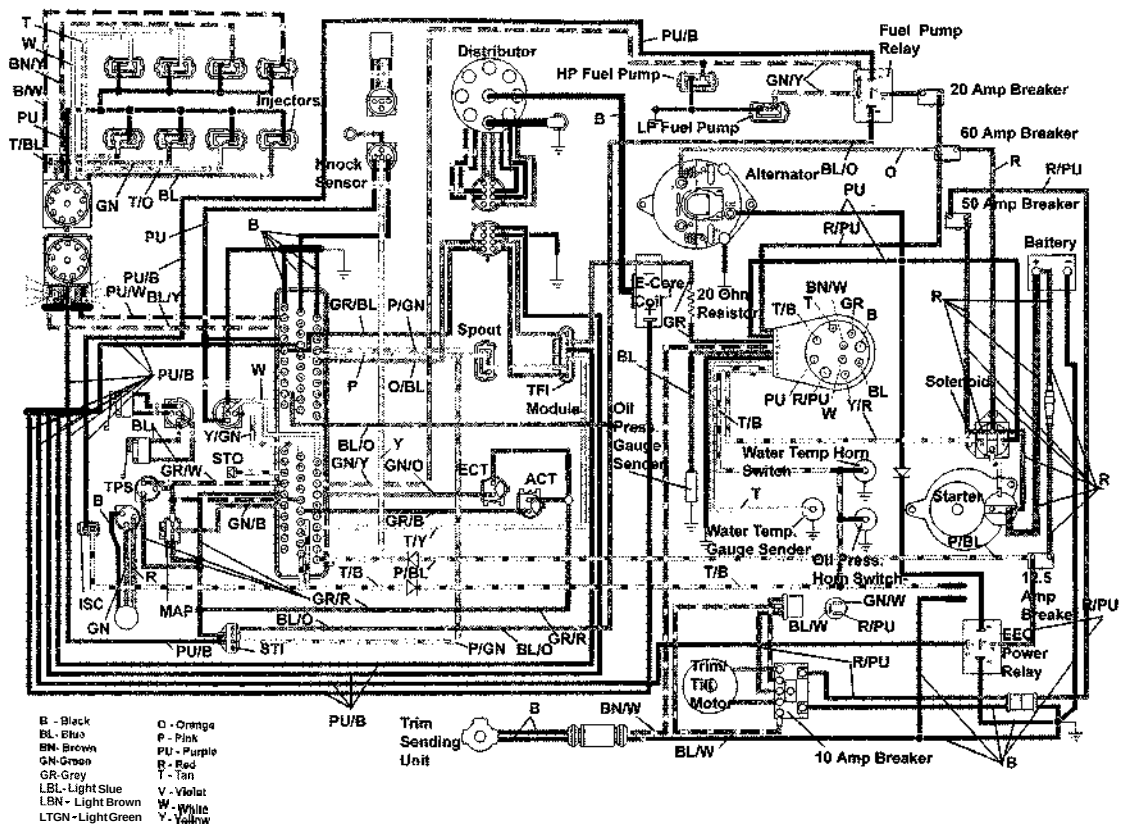


Fig. 183 Engine wiring schematic—1994 351 EFI Ford engines w/King Cobra

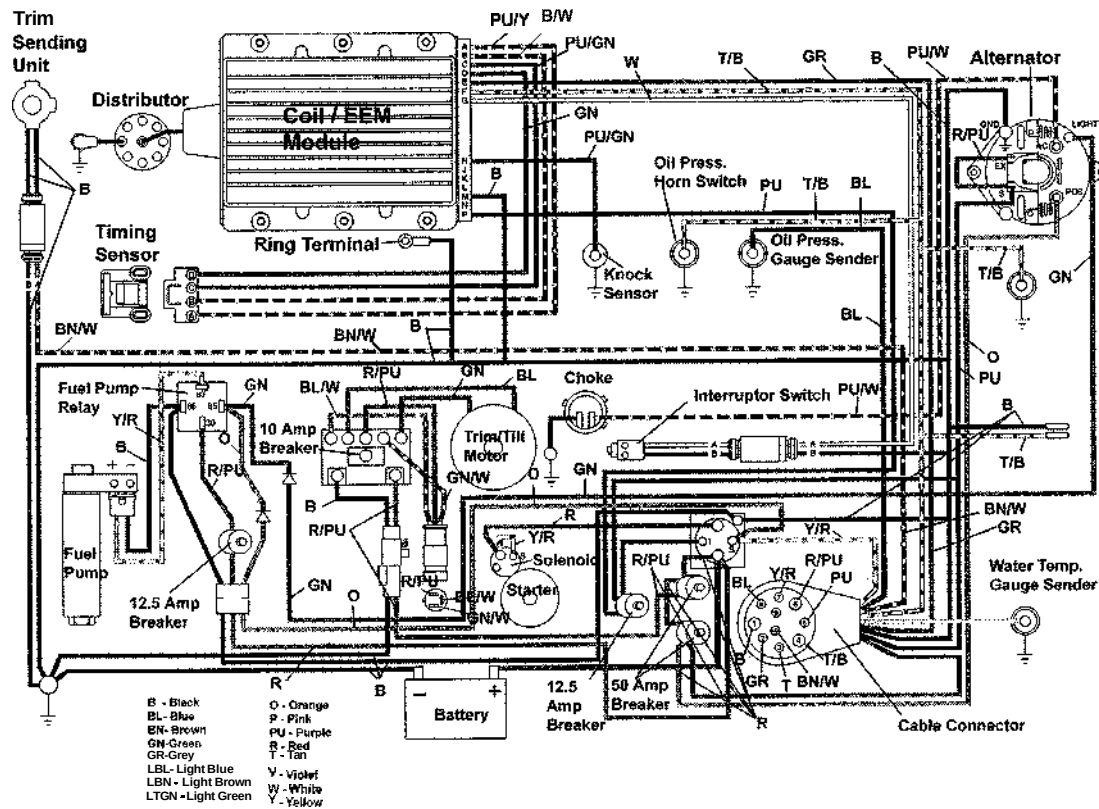


Fig. 184 Engine wiring schematic—1994 7.4GL GM engines w/King Cobra

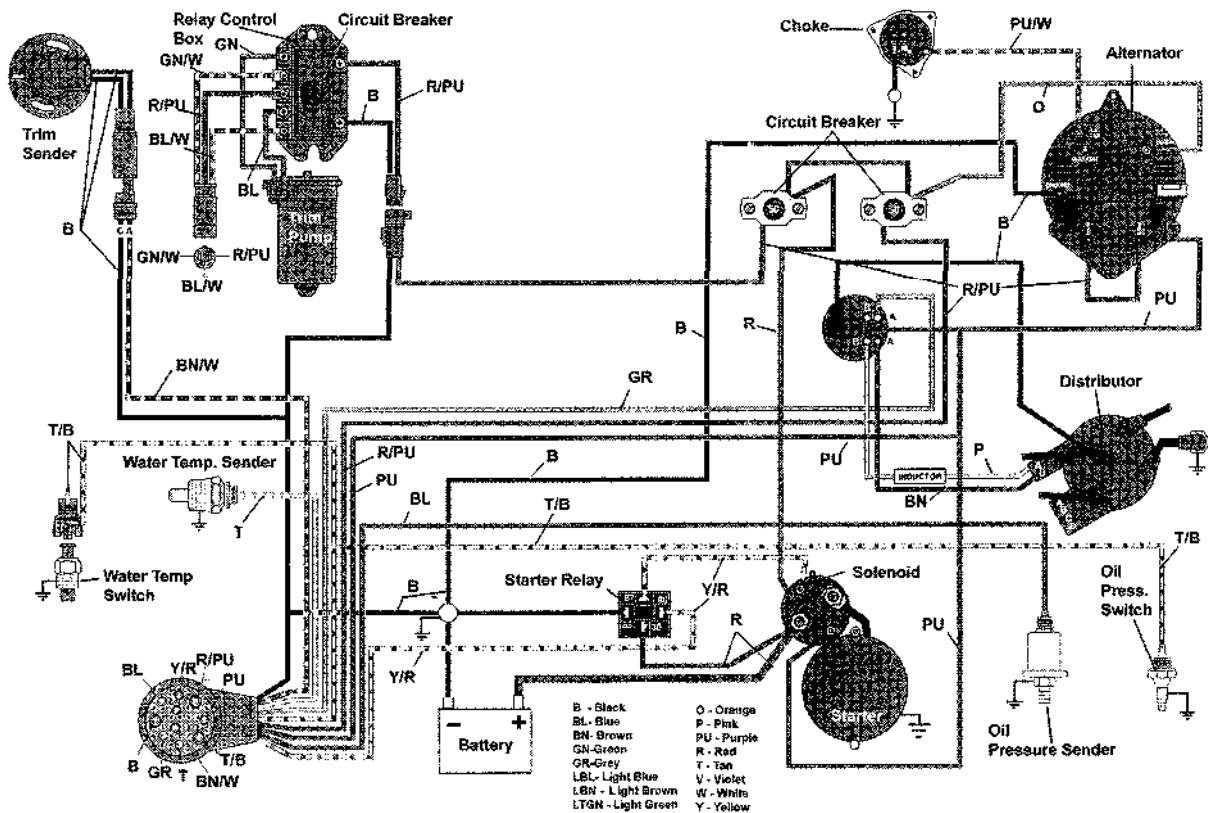


Fig. 185 Engine wiring schematic—1995-96 3.0GS GM engines. 1996 trim sender has 3 wires

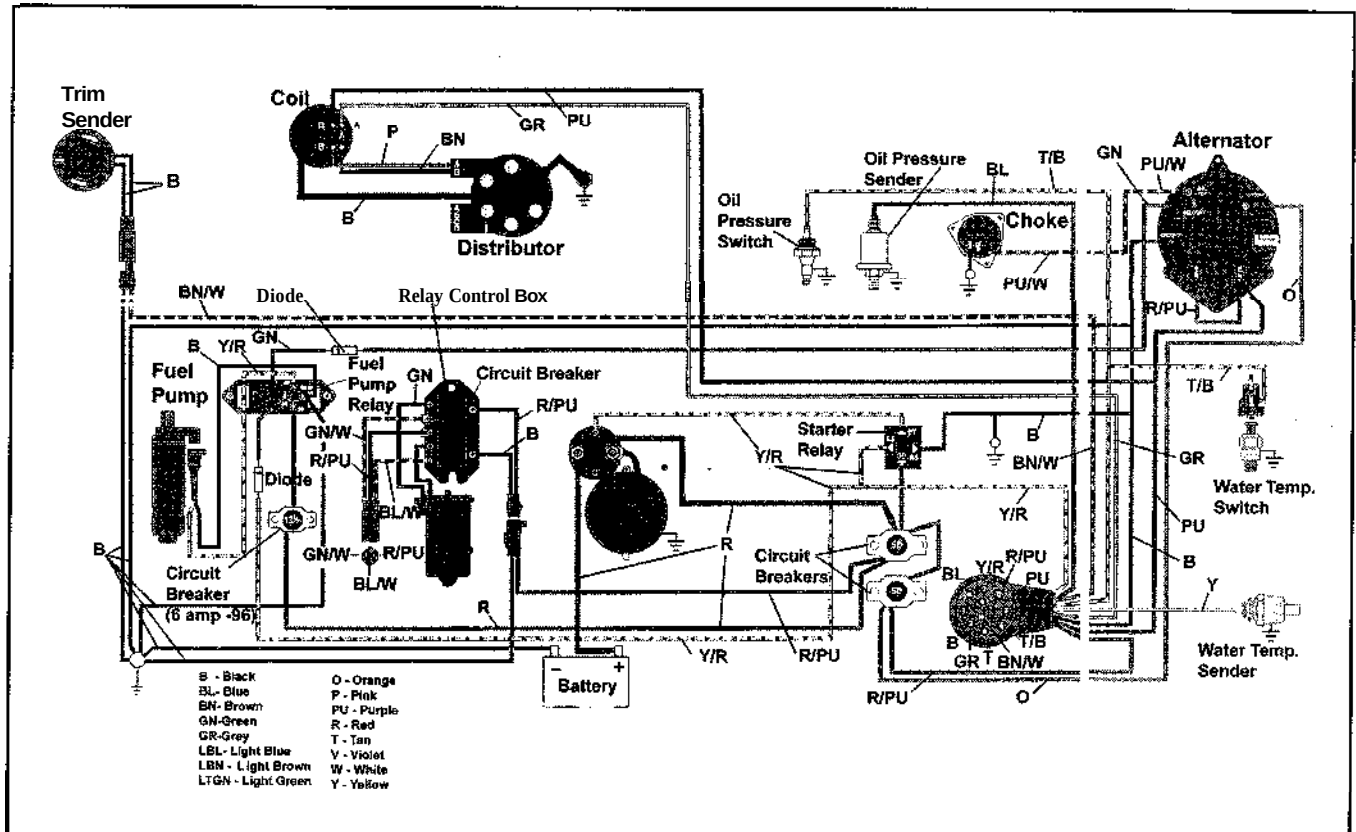


Fig. 186 Engine wiring schematic—1995-96 4.3GL/GS GM engines. On 1996 engines, the trim sender has 3 wires and there may be a 10 amp fuse on the R/PU wire at the relay control box

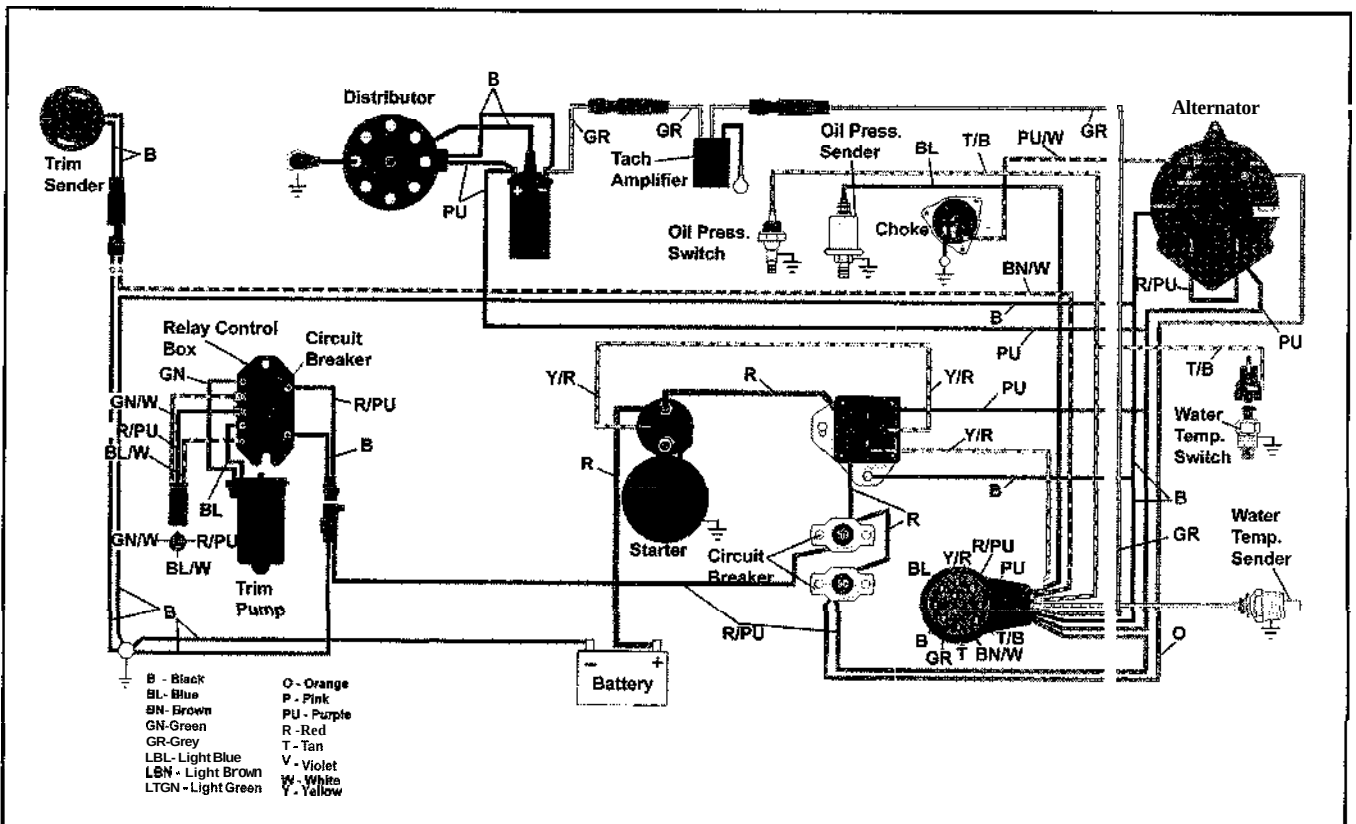


Fig. 187 Engine wiring schematic—1995-96 5.0FL and 5.8FL Ford engines. On 1996 engines, the trim sender has 3 wires and there may be a 10 amp fuse on the R/PU wire at the relay control box

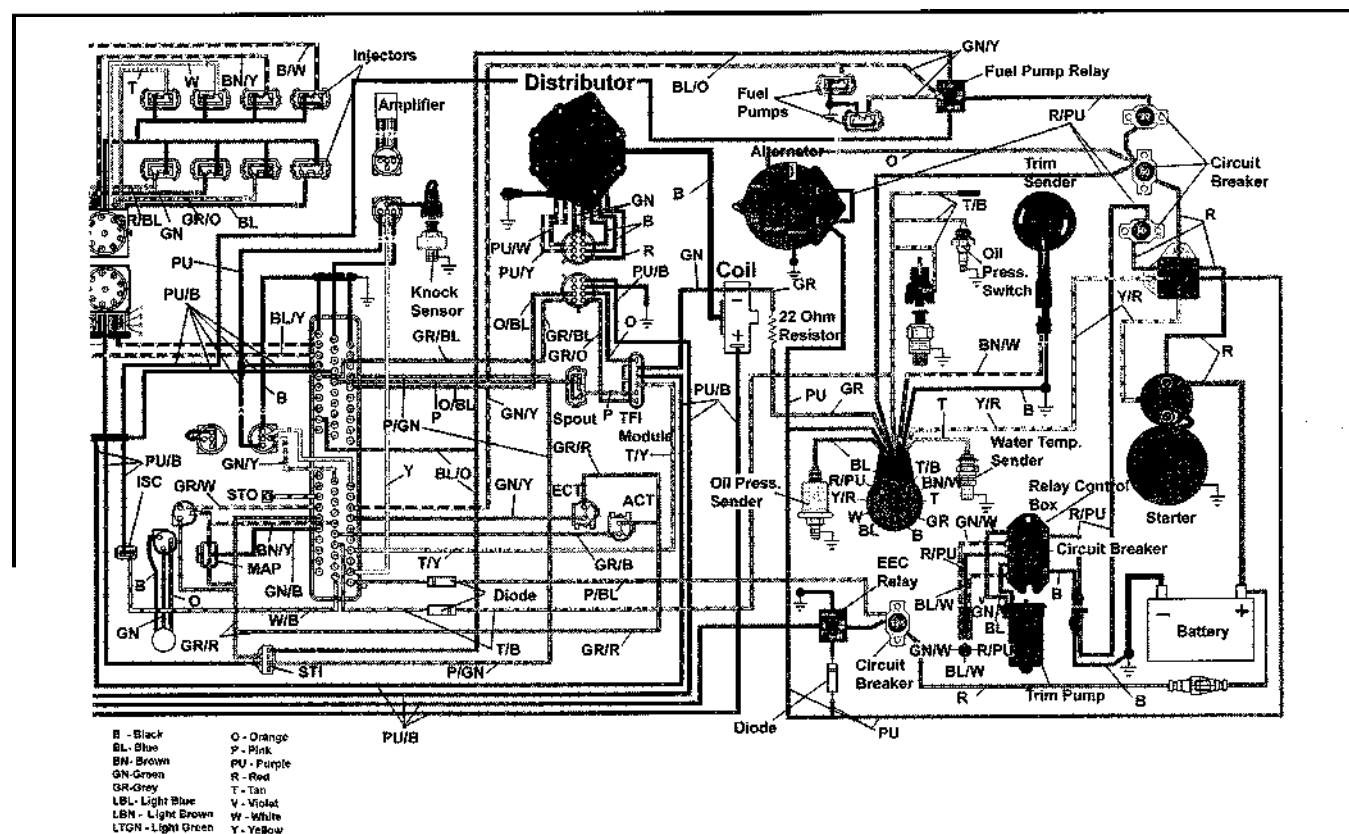


Fig. 188 Engine wiring schematic—1995-96 5.0FI and 5.8FI Ford engines. On 1996 engines, the trim sender has 3 wires and there may be a 10 amp fuse on the R/PU wire at the relay control box

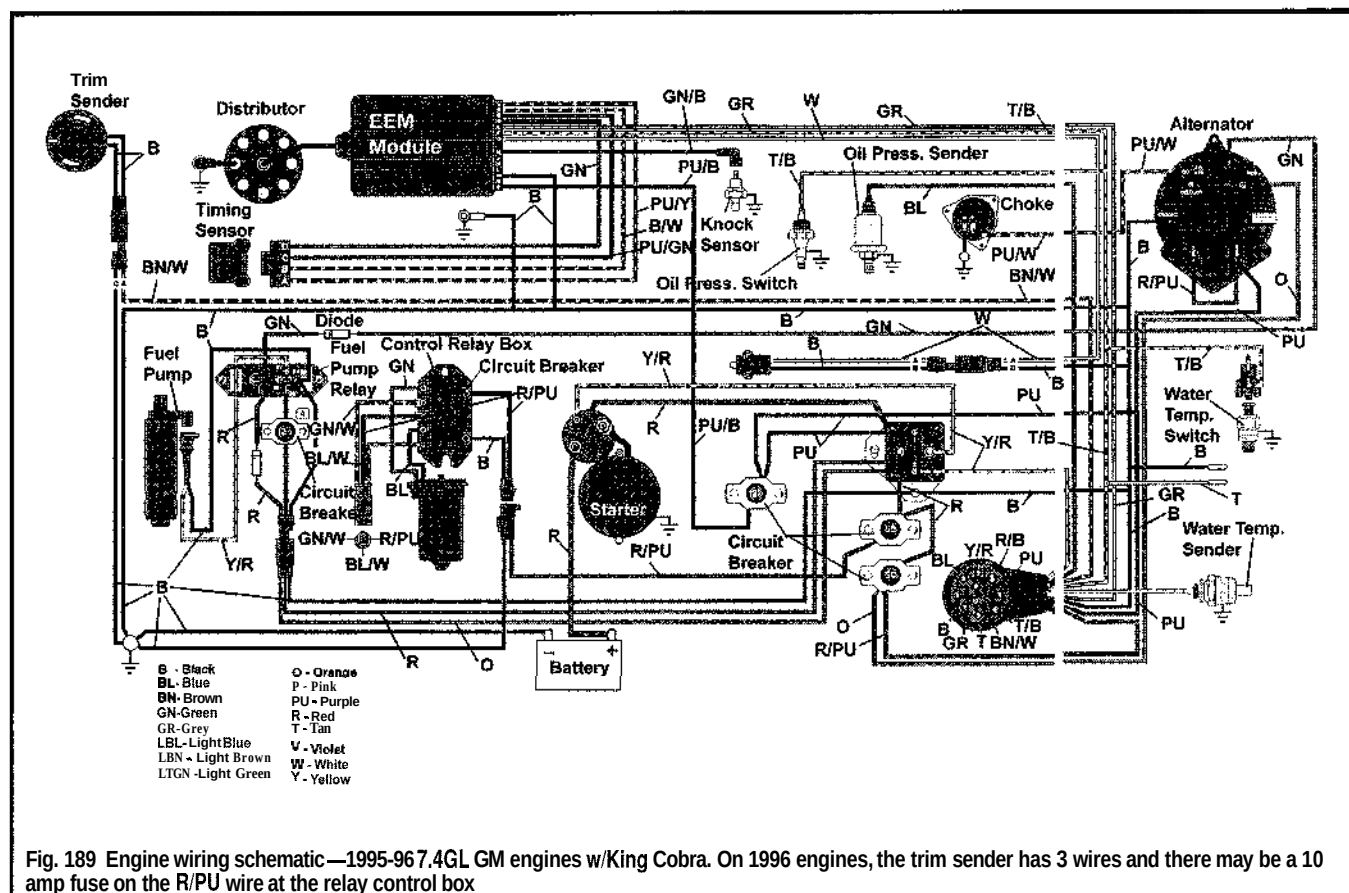


Fig. 189 Engine wiring schematic—1995-96 7.4GL GM engines w/King Cobra. On 1996 engines, the trim sender has 3 wires and there may be a 10 amp fuse on the R/PU wire at the relay control box